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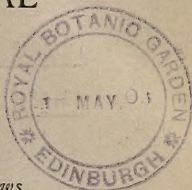
MEMOIRS

OF

THE ROYAL CALEDONIAN HORTICULTURAL SOCIETY

A. D. RICHARDSON, *Honorary Editor*

*The Society does not hold itself responsible for the statements or views
expressed by the authors of the papers*



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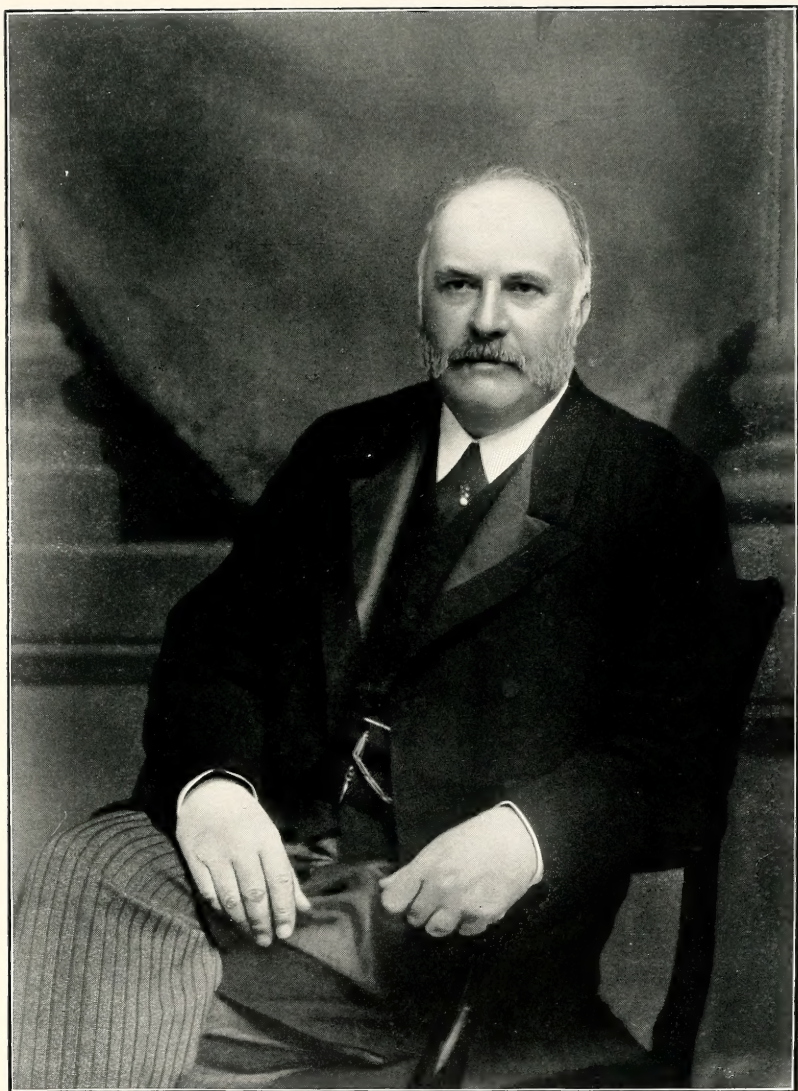
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INTRODUCTORY NOTE.

THE Caledonian Horticultural Society was founded on 5th December 1809, at a meeting held in the Hall of the Royal College of Physicians, Edinburgh, and two years later it resolved to publish its Horticultural Papers. The publication of these papers was forthwith commenced, and on 22nd August 1814 the first volume was completed, and, under the title *Memoirs of the Caledonian Horticultural Society*, was dedicated to His Royal Highness George, Prince of Wales, Regent of the British Empire.

The career of the Society's *Memoirs* was not, however, destined to be of long duration, for in 1829, apparently solely owing to want of support on the part of the horticultural public, with the completion of the fourth volume the venture came to an end.

In the beginning of the twentieth century the Royal Caledonian Horticultural Society essays another venture of the same kind, and, relying on the wider interest which Horticulture can now lay claim to amongst all classes, and taking into account the vast importance to which it has attained in the interval from a national-economic point of view, the Society trusts that, in their modernised garb, the *Memoirs* will meet with greater appreciation on the part of its members, and of the public generally, than did their predecessors in the early part of last century.

In bringing the first part of the new series of the *Memoirs* under notice, the Society desires it to be known that in the initiation of the project it has received much encouragement and assistance from within its own ranks, that some of the

best authorities in their respective departments of horticulture, botany, and allied subjects have contributed papers of great value, and that others have promised contributions in the future. It is hoped, therefore, that the interest which the Society feels will be awakened by the appearance of the first part of the *Memoirs* will be sustained as the succeeding parts appear, and that from time to time articles will be forthcoming which will be of value alike to professional horticulturists and to that large section of the public which takes such a deep interest in horticulture as a health-giving pastime, and as a distraction from the worries and anxieties of business and professional life.

EDINBURGH, *February* 1905.

MEMOIRS
OF THE
ROYAL CALEDONIAN
HORTICULTURAL SOCIETY.

ALPINE PLANTS.

By ROBERT LINDSAY, Kaimes Lodge, Murrayfield.

THERE is no branch of horticulture more fascinating than the cultivation of Alpine plants. And there is this advantage in Alpine gardening that it adapts itself admirably to the time and means at the grower's disposal. The man of means who can employ many skilled gardeners will find a rock-garden of quite as absorbing interest as a range of hothouses filled with exotics; of infinitely greater interest if he explores the slopes and recesses of Alpine regions and brings home his plants as the prizes of his own trowel. But the cultivation of Alpines is pre-eminently the thing for the owner of a small garden. If I possessed one square yard of soil, and no more, I would not plant on it a Laurel or Laurustinus; I should make it into an Alpine garden and have a score of interesting plants instead of one. Here I had better say what an Alpine is. Definitions, as we know, are sometimes difficult, and I cannot pretend to give such a definition as will enable one to decide in every case whether a given plant is an Alpine or not; but for practical purposes it is possible to say nearly enough what an Alpine is. An Alpine is, properly speaking, a mountain plant. For the most part, Alpines are of small stature. The regions they inhabit are swept by violent and nipping winds, and if they raise

their heads there is trouble for them in the air, therefore an instinct, the accumulated experience of many generations, tells them to lie low and hug the warm ground. In most Alpines modifications of the tissues occur in order to protect them against the rigours of high altitudes; in one it is a thickening of the leaf, in another a growth of down, in many a combination of the two. A large proportion of Alpines are caespitose, that is, they grow into a compact matted turf, and it is this neat turfy habit, combined with their lovely shades of colour, ranging from silver-grey through emerald to bronze, that gives



Fig.-1. *Leontopodium alpinum*—Edelweiss. (Photo by D. S. Fish.)

to such plants a charm all the year round, a charm which belongs to plants of more straggling growth only at certain seasons. But though a sturdy squatness and spareness of habit is characteristic of the Alpine flora, there are many Alpines ample enough in their dimensions. Some of our most handsome shrubs, such as *Rhododendron ferrugineum* and many of the New Zealand Veronicas, for example, are mountain plants. There are also numerous dwarf-growing herbaceous plants, not Alpines in the strict meaning of the term, that are frequently cultivated along with real Alpines. These plants are often found in Alpine meadows and valleys, sometimes in bogs, and even at the seashore. As a rule, they are easier to grow and are of more rampant

growth than true Alpines, consequently when associated with them they require careful watching lest they overshadow and choke them, but both kinds grow well together if this precaution is taken. It might be supposed that growing on the high, exposed, bleak portions of the earth, Alpines would show the



Fig. 2. *Primula sikkimensis*, N. India, 12,000 to 17,000 feet.
(Photo by D. S. Fish.)

same parsimony in bloom that they do in other parts of the plant. Nature, however, for reasons of her own, has not so ordered it. No doubt amongst Alpines there are many cases of inconspicuous inflorescence, where Nature has sufficiently ensured reproduction without any obtrusive display of colour. But in a large proportion of Alpines the size of the flower is out of all pro-

portion to the size of the plant, while the colours are often rich and even dazzling. The Alpine Pink (*Dianthus alpinus*) has foliage very little higher than the grass on a mown lawn, but each stem produces a glowing pink flower as large as a florin; and again, the large azure cup of *Gentianella* rises from a plant that is little higher than a lichen. It frequently happens, however, that the blossom is as diminutive as the plant which carries it; but in that case profusion of bloom often makes up for what the flowers lack in individual size, a kind of compensation very specially noticeable in such families of



Fig. 3. *Anemone alpina*—Alpine Windflower. (Photo by D. S. Fish.)

plants as the *Silenes*, *Saxifrages*, and *Sedums*, in some of which one can scarcely see the leaves for flowers.

The question of the cultivation of Alpines resolves itself into one of soil, position, and shelter. In respect of soil, for the great majority of Alpines depth and mechanical condition are of more importance than its chemical properties. Most Alpines have long roots, out of all proportion to the size of the part above ground. Nature has found it necessary to give to the wildings which she places in her arid slopes and cliffs long wiry roots that can strike down till they reach perennial sources of moisture. One has only to dig up a *Hepatica* or a *Hellebore* in order to understand the

immense development of root that may be necessary to comparatively small plants, therefore let the soil for Alpines be deep. Also let it be well drained; for though everyone who has explored Alpine or sub-Alpine country knows that bogs are of frequent occurrence there, and that the bog vegetation is of the greatest interest, yet the great bulk of our Alpines grow in situations where, however plentiful the supply of moisture, the drainage is perfect. As to the chemical character of the soil to be used, that will depend on what it is desired to grow. Some Alpines are fastidious as to soil, and part of the interest in growing these plants lies in the very difficulty of meeting their requirements. Some Alpines like peat, some grit, some limestone, and those who grow Alpines on a large scale take care to provide suitable soil for such fastidious subjects. But most Alpines grow well in ordinary garden soil, provided it is deep enough and open enough. Soil that is open and gritty will grow most things well, whereas soil, however deep, that cakes and cracks on the surface, and in wet weather has the consistency of dough, will grow little that is more delicately rooted than a Horse Radish. Of equal importance to the question of soil is that of exposure. As there are plants that require particular soils, so there are plants that require particular exposures, where they can get the morning sun, or the afternoon sun, or no sun at all; but my own experience is that most flowering plants are happiest with abundance of air and sunshine, therefore it is safe to construct the Alpine garden in an exposed place where no shadows from trees will fall upon it. The ideal spot for the Alpine garden would be a rocky slope, such as one may see in any Alpine district, where the rocks jut out from a deep and friable soil, affording numerous nooks and niches in which the Alpines may lie snugly sheltered from the wind, and catch every drop of rain and every beam of sunshine. It is Nature that the cultivator of Alpines would fain imitate when he makes his rock-work, large or small; but it is a libellous imitation in most cases, a caricature of Nature to be deprecated rather than encouraged; yet in growing Alpines, in whatever kind of soil, there is much virtue in a stone. To be convinced of this, one has only to note how the long roots of a delicate Alpine will hug the stone beside which it is planted, and there is an overground as well as an underground use for stones, for



Fig. 4. Steep rock-work bank at Kaim's Lodge, Murrayfield.
(Photo by P. M. Thomson.)

the slight protection which they give above ground is just the protection the plant requires to make it thrive, to say nothing of the fact that the leaves and stems, as well as the roots, of many plants love to follow the surface of a stone. Further, the rock-work system of growing Alpines has this advantage also that it enables the cultivator to protect the weaker and more delicate, and therefore more precious, Alpines from an invasion of their coarser neighbours. For one Alpine that is lost through unsuitability of soil and exposure, ten are lost through being



Fig. 5. *Primula nivalis* of gardens. (Photo by D. S. Fish.)

throttled by some rampant Crucifer or Composite neighbour; therefore it is a useful protection to a tender Alpine to be fenced with a stone wall of its own, beyond which no neighbour may encroach. But in growing Alpines, care should be taken that the stones are used to grow the Alpines, and that the Alpines are not used merely as an adjunct to the stones. The main consideration should be that as the rockery is to be the home of living plants nothing should be allowed to interfere with their ultimate development.

If one has abundant means at command, one may aim at

making a miniature facsimile of the real rocks and mountains, otherwise this slavish imitation should be left severely alone, and the aim should rather be to hide the stonework as much as possible with the living green plants. Hundreds of pretty and interesting Alpines may be grown without any special Alpine garden. The formal and stiff box edging, not a very attractive thing in itself, however neatly kept, occupies in many gardens space which would hold quite a large collection of Alpines. A



Fig. 6. *Sempervivum arachnoideum* Laggeri. (Photo by D. S. Fish.)

stone or tile edging is not in itself so neat, perhaps, as a well-kept box or ivy edging, but when the stone or tile is planted with a varied collection of minute compact-growing Alpines—Sedums, Saxifrages, Gentians, etc.—the edging becomes one of the most interesting things in the garden. By utilising this waste space, even the smallest garden may have its assortment of interesting Alpines. Where, however, an Alpine garden is constructed, a supply of good porous stone is very desirable. At the same time it is necessary to remember that such construction is in no respect essential to the successful cultivation of Alpines, and

that they may be grown to perfection without the aid of rock-work at all. They may be grown very successfully in pots; indeed, some of the finest Alpines I ever saw were grown in pots, and the exhibits of Alpines we see at our flower shows from time to time abundantly testify that they may be grown to perfection in this way. Yet there is much need for improvement, particularly in the choice of plants for exhibition. How frequently does one see a good collection of Alpines spoiled by the inclusion of one or more tender plants. *Primula verticillata* seems to be a common offender in this respect, and as there are hundreds of good hardy Alpines to choose from, there is no excuse for this practice. It may be of use, therefore, to append a list of suitable Alpines for cultivating for exhibition in pots. These are so numerous that it is difficult to make a selection without leaving out many good things. No attempt will be made to make an exhaustive list; those interested in this form of horticulture will have no difficulty in adding hundreds of other choice plants to it.

The hybridist has been here, as elsewhere, and has evolved out of the raw material many of the best and most useful plants for the rock garden—Aubrietias, Campanulas, Helianthemums, Phloxes, Saxifrages, etc., have in turn afforded good results. If the hybridist has not been able in all cases to improve the individual flower to any great extent—we must remember that some of them can hardly be improved upon—he has in many cases given us hybrids much easier to cultivate (being to the manner born, so to speak) than are the pure species, and there can be no question that their value in adorning the rockery is great indeed. Further, the beauty of Alpines is by no means confined to the flower of the plant. In many cases the flower holds but a secondary place to beautiful foliage or character of growth. Many Saxifrages and Sempervivums illustrate what is meant. In whatever way Alpines may be grown, whether on rock-work, in the open borders, or in pots, the necessity for frequently dividing and thus increasing the stock should never be lost sight of, as most plants, when allowed to remain in the same spot for a long time, will be found to deteriorate and ultimately die out altogether. In some cases this mode of increase will not be possible; then recourse must be had to cuttings, or even to grafting; but the best way of all is by raising plants from

seed, whenever it can be obtained. Not only is it the most natural method of increasing the stock, but we have the chance of getting, by natural selection, improved varieties better fitted in some respects than their parents to withstand the



Fig. 7. *Helianthemum*. (Photo by D. S. Fish.)

rigours of our uncertain climate. Besides, seedlings are usually stronger, and therefore better able to stand. By one or other of these means a supply of vigorous young plants may be obtained, to take the places of older plants that may become exhausted or worn out. A large number of Alpines are of comparatively easy culture, but there are a few that refuse to

be tamed, which seem always to go from bad to worse, and are never presentable for two seasons together. Of these,



Fig. 8. Saxifraga "Dr. Ramsay," Saxifraga M'Nabiana \times , Saxifraga lantoscana superba. (Photo by D. S. Fish.)

Gentiana bavarica and *Eritrichium nanum* may be cited as examples.

LIST OF PLANTS FOR A ROCKERY.

Those marked thus * are suitable for Pots.

- Adonis pyrenaica.*
vernalis.
Alyssum saxatile and varieties.
 * *Androsace carnea* and varieties.
 * *Chumbyi.*
 * *coronopifolia.*
 * *lanuginosa.*
 * *sarmentosa.*
 * *villosa.*
Anemone alpina.
 apennina.
 blanda and varieties.
 Hepatica and varieties.
 memorosa and varieties.
 ranunculoides.
Arabis albida, fl. pl.
Arenaria montana.
 balearica.
 laricifolia.
 * *Arnebia echioides.*
 * *Asperula cynanchica.*
 * *hirta.*
 * *nitida.*
Aster alpinus and varieties.
Astragalus alpinus.
Atragene alpina.
Aubrietia deltoidea and varieties.
Bruckenthalia spiculifolia.
 * *Bryanthus erectus.*
Calluna vulgaris and varieties.
 * *Campanula abietina.*
 barbata.
 * *garganica* and varieties.
 * *pulla.*
 turbinata and varieties.
 * *Cassiope fastigiata.*
 tetragona.
 speciosum and varieties.
 * *Cheiranthus Allioni.*
 alpinus.
 * *Chionodoxa Lucilæ* and varieties.
 ties.
 * *Colchicum autumnale* and varieties.
 ties.
 * *Cornus canadensis.*
Crocus Boryi.
 Imperati.
 speciosus.
 vernus and varieties.
 * *Cyananthus lobatus.*
 * *Cyclamen Coum.*
 * *europæum*
 * *Cytisus Ardoini.*
 * *decumbens.*
 * *Daphne alpina.*
 Cneorum.
- * *Dianthus alpinus.*
 * *Atkinsoni.*
 Fischeri.
 integer.
 * *neglectus.*
 * *Draba Aizoon.*
 * *Mawii.*
 * *pyrenaica.*
 * *Dryas octopetala.*
 * *Edraianthus serpyllifolia.*
 * *Epilobium obcordatum.*
 Erica carnea and varieties.
 australis.
 ramulosa.
 * *Erigeron aurantiacus.*
 * *Erinus alpinus* and varieties.
 * *Erodium Reichardi.*
 Galanthus nivalis and varieties.
 Gentiana acaulis.
 asclepiadea.
 * *septemfida cordifolia.*
 * *verna.*
 * *Globularia cordifolia.*
 * *nana.*
 Helianthemum vulgare and varieties.
 Hippocrepis comosa.
 * *Hutchinsia alpina.*
 * *Hypericum nummularium.*
 verticillatum.
 * *Iberis corneefolia* and varieties.
 petraea.
 * *saxatilis* and varieties.
 * *Iris cristata.*
 * *iberica.*
 reticulata and varieties.
 verna.
 * *Leontopodium alpinum.*
 Leucojum vernum and variety.
 Linaria alpina.
 origanifolia.
 * *Linum alpinum.*
 campanulatum.
 * *salsoloides.*
 * *Lychnis alpina.*
 Viscaria and varieties.
 Menziesia empetriformis.
 Mertensia primuloides
 Mimulus Burnettii.
 * *Mitella cordifolia.*
 * *Morisia hypogæa.*
 Myosotis alpestris.
 * *Muscari armeniacum.*
 Narcissus
 poeticus and varieties.
 Pseudo-narcissus and varieties.
 triandrus and varieties.

- Oenothera marginata*,
Olearia nummularifolia,
Ononis rotundifolia,
Onosma taurica,
 **Oxalis enneaphylla*,
 **Papaver alpinum*,
Pentstemon Menziesi,
 procerum,
 Scouleri,
Phlox amœna,
 setacea and varieties,
 **Potentilla alchemilloides*,
 formosa,
 **nitida*,
 Leschenaultiana,
 lanuginosa,
 **Polygala Chamæbuxus*,
 **Polygonum vacciniifolium*,
Pratia angulata,
Primula,
 **calycina*,
 **capitata*,
 **carniolica*,
 **ciliata purpurata* and varieties,
 decora,
 **denticulata* and varieties,
 **Dinyana*,
 **Forsteri*,
 **frondosa*,
 **hirsuta* and varieties,
 **marginata* and varieties,
 **minima* and varieties,
 **rosea* and varieties,
 **scotica*,
 **Sieboldi* and varieties,
 **venusta*,
Ramondia pyrenaica,
Rhododendron ferrugineum,
 lepidotum,
 Kamtschaticum,
Rhodothamnus Chamæcistus,
 **Saponaria ocymoides*,
Saxifraga apiculata,
 **aretioides* and varieties,
 **Burseriana* and varieties,
 **calyciflora*,
Saxifraga Cotyledon and varieties,
 lantoscana and varieties,
 **oppositifolia* and varieties,
 **porophylla*,
 Rhei and varieties,
 **squarrosa*,
 valdensis,
 **Willkommiana*,
Scabiosa Pterocephala,
Scilla bifolia and varieties,
 sibirica and varieties,
 **Sedum cyaneum*,
 **pulchellum*,
 **rupestre*,
 spectabile,
 **Sempervivum Hookerii*,
 **arachnoideum*,
 **arenarium*,
 **montanum*,
 **triste*,
 **Silene acaulis* and varieties,
 alpestris,
 **Pumilio*,
 Schafta,
 **Soldanella montana*,
 **Synthyris reniformis*,
 **Teucrium pyrenaicum*,
 **Thymus Serpyllum* and varieties,
 **Trifolium alpinum*,
 uniflorum,
Trillium grandiflorum,
Trollius,
 **acaulis*,
 europæus and varieties,
Veronica Armstrongii,
 Fairfieldii,
 cupressoides,
 Hectori,
 **linifolia*,
 pimeleoides,
 lycopodioides,
 **glauco-cærulea*,
 rupestris,
 salicornioides,
 saxatilis and varieties,
Vinca herbacea,

HYBRIDISATION.

By JOHN H. WILSON, D.Sc., F.R.S.E.,
Lecturer in Agriculture, St Andrews University.

REFLECTIONS.

It is one of the privileges of a hybridist's life that his work so often by its very nature leads beyond the confines of strictly utilitarian and commercial matters to the realm of reflection and philosophic speculation. He deals with the living plant. As time goes on, he becomes more and more familiar with what, in a well-worn figure of speech, is termed the mechanism of the flower. The similarity of function, if not in structure, existing between plants and animals becomes daily more obvious to him. He cannot be long engaged observing the habits of plants until he comes to realise "how akin they are to human things."

One of the most interesting reflections bearing on plant improvement is that made occasionally to the hybridist by good folks who retain remnants of pre-Darwinian philosophy, such as led our worthy forefathers to abjure the introduction of fanners to winnow the grain as being, in their opinion, an interference with providential means of securing the same object by waiting on a fair wind to blow through the barn door. Oftener than once we have heard the suggestion pretty plainly put that it was an intervention with the ways of Providence to attempt to change the forms of plants. We are afraid that a famous Californian hybridist had never had such a suggestion made to him, else he would have paused before issuing his fine catalogue of new cross-bred plants under the title of "New Creations."

But what would our gardens and fields be full of to-day if we had reasoned ourselves into the belief that we should leave plants as we find them? The answer is briefly, Weeds. Even although we were debarred from practising the hybridist's art, the mere cultivation of the wild plants in the garden would

most certainly in time bring about changes in their appearance and nature. Without improvement deliberately carried out by the hand of man, what would our Apples, Gooseberries, and the great majority of garden fruits be like, and where would our Pansies and Auriculas be? Moreover, when did improvement of plants useful to man begin? Who can point for certain to the truly wild Wheat or Oat?

Although in a dim way recognised by the ancients, it is only in comparatively recent times that the functions of the floral organs have been clearly demonstrated, and the possibilities of improvement by crossing suggested. The revelation has not been sudden, but by long and laborious investigation and experiment. Obdurate dogmatism has had to be overcome and contorted vision of plain facts corrected. Every child at school is nowadays made familiar with the structure and general functions of the flower. The hybridist now works with absolute freedom, no barriers being set to his achievements save those that Nature herself has set.

Another reflection one sometimes hears expressed, and one well worth expressing, is that some plants cannot be improved upon. Or, again, the hope may find utterance that nobody will attempt to cross this or that. There are plants which, no doubt, have attained so near to what is considered the perfection of beauty that it does seem presumptuous to try to improve on them. It were hard to add grace or beauty of colour to the Purple Foxglove, or give an added modesty or pleasanter perfume to the Primrose.

NEW INTRODUCTIONS.

We are unspeakably indebted to travellers for the introduction of beautiful and useful plants from foreign countries. Every garden of any size in our country contains the lovely wildings of other climes, those from temperate regions being grown in the open, and those from sub-tropical or tropical regions under glass. While many plants, both native and foreign, introduced into cultivation are undeniably fine, perhaps an equal number of them are susceptible of improvement in the eyes of the plant-breeder. Some get a cordial welcome on account of being suitable for the purpose of improving plants already in cultivation. We may here recall

experiments carried out by us a good many years ago. A *Gladiolus* was sent to us from South Africa. It was found wild there. No doubt if one could have seen it in the veldt it would have been pronounced to be in perfect accord with its surroundings. But when flowered in the garden at home it compared unfavourably with its domesticated neighbours. Its perianth did not open out well, and the colour consisted of crimson flakes and speckles on a rather dull yellowish background. In short, it did not conform well to the ideal garden *Gladiolus*. By crossing with other gladioli the characters of the Cape species were modified, but, on the other hand, it was found to be unsuitable for crossing with varieties already in favour, with the view to their improvement.

UNASSISTED CROSSES.

It is a well-known circumstance that crossing occurs in nature. A natural hybrid of common occurrence is that between the Primrose and Cowslip, the resultant plant being indistinguishable from the Oxlip. The hybrid shows many intermediate characters in shape, colour, and time of flowering. Another and even more familiar wild hybrid is *Geum intermedium*. It is often met with in one's country rambles. Its parents are the Water Avens (*Geum rivale*) and Herb-Bennet (*Geum urbanum*). In some groups, as in Willows, Roses, etc., natural crossing is so prevalent as to lead to confusion and trouble in classification.

Seeing that such events happen in the open, it is not surprising that crossing should take place among the more carefully protected plants of the garden. It is highly probable that many good things have been lost through the garden being hoed and cleaned too assiduously. Among many examples which might be named, we may specially refer to the now very familiar Logan Berry (fig. 1), a cross between a Bramble and a Raspberry which sprang up in a private garden in California.

An interesting hybrid was noticed by the late Professor Henslow in his garden at Cambridge in 1831. Its parents were obviously *Digitalis lutea* and *D. purpurea* (the Purple Foxglove), both of which were cultivated in the garden. The same cross has occurred spontaneously elsewhere. We have

repeated the cross deliberately, and found the hybrid plant to agree closely with the description given of the above. The hybrid, although less massive, is, when at its best, not without a good deal of the stately mien of the Foxglove. The flowers (fig. 2, *b*) are smaller, and are borne in great profusion. It is somewhat puzzling to find the plant so distinctly perennial. An explanation in part is afforded by the fact that it never bears seed. The capsules swell and give great promise of seed,



Fig. 1. Logan Berry.

but the promise is not fulfilled. There is thus no drain on the strength of the plant, such as its parents are subjected to, both bearing a large quantity of seed. The one parent is usually biennial, the other persists for a few years, but not nearly so long as the hybrid. Such, at anyrate, has been the case with our plants. Inability to bear seed is a common characteristic of cross-bred plants.

POPULAR DELUSIONS.

Speaking of Foxgloves, one is reminded of the astonishing announcement repeatedly made in the public prints that a cross

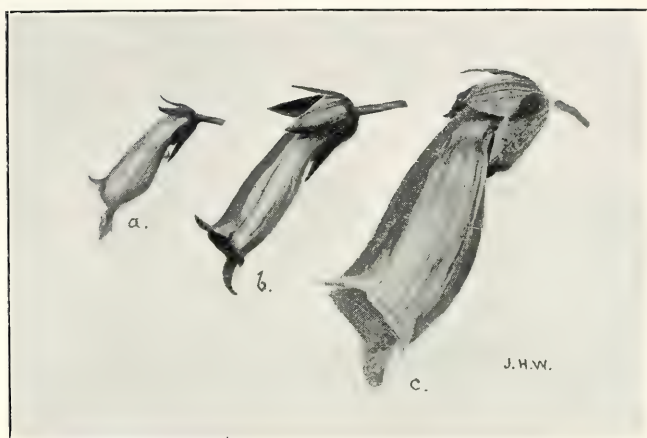


Fig. 2. *a. Digitalis lutea* ; *c, D. purpurea* ; *b, Hybrid.*



Fig. 3. Floral monstrosity (peloria) of Foxglove.

has been found between a Foxglove and a Canterbury Bell, the latter being a *Campanula*. Such a cross is held by all botanists to be an utter impossibility, because the plants stand so far apart in genealogical relationship. It would be equally impossible, we would suppose, to cross the Apple and the Orange, or the Gooseberry and the Grape. The bell-like "flower" borne by the Foxglove occurs at the top of the inflorescence, all the



Fig. 4. Flower of Strawberry-Raspberry.

flowers beneath it being of the ordinary glove-finger shape (fig. 3). It is easy to see that the great bell at the top is composed of a number of flowers fused together, but how this happens has never been satisfactorily explained.

Another popular delusion, and one of more recent origin, has reference to the so-called Strawberry-Raspberry (figs. 4, 5). The Bramble and Raspberry are quite closely related, but it is a different matter with the Strawberry and Raspberry. Although they fall under the same great family of the Roses, they are

essentially distinct in habit, and in form of flower and fruit. Botanists refer them to separate genera. Experience has shown, however, that the arbitrary limits imposed by generic distinction may now and again be passed, bigeneric hybrids being the result. In a conversation we had with Mr Luther Burbank at Santa Rosa, California, we learned that he had succeeded in crossing such genera as *Lilium* and *Trillium*, and *Amaryllis* and *Crinum*, as well as the Strawberry and Raspberry. Referring to the last, Mr Burbank states that "out of



Fig. 5. Fruit of Strawberry-Raspberry.

seven or eight hundred of these curious hybrids, not one has ever produced a berry, though blooming with the greatest profusion." The plants produced canes which were thornless or nearly so, and the leaves were invariably trifoliate. The plant in the market under the name of the Strawberry-Raspberry is a pure species (*Rubus rosafolius*, *syn.*, *sorbifolius*), and native of China and Japan. It is not without features which one would associate with the cross inferred by its popular name. One lesson connected with the story of the plant is, that granting reasonable limits of consanguinity, we cannot be at all sure what will cross until we try.

GOOSEBERRY CROSSES.

It was long considered impossible to cross the Black Currant with the Gooseberry. This has been accomplished oftener than once in recent years. Our own experiment was quite successful. The hybrid plants bear a multitude of flowers (fig. 6), and are diligently visited by bees, but fruit with us is an extremely scarce commodity. There is reason to believe that they can by some means be brought to bear more freely. It is not un-



Fig. 6. Flowering shoot of Black-currant-Gooseberry hybrid. (Block lent by Royal Horticultural Society, vol. xxiv, *Jour. R. H. S.*, fig. 78.)

interesting to find that the leaves are in great favour with the Gooseberry Sawfly caterpillar.

Another cross of ours in the same family is of even greater interest, viz. that having the Gooseberry and Flowering Currant as parents. Our plant shows the blending of both distinctly (fig. 7). It is now a fine strong bush, but is evidently determined to be in no hurry even to flower. It would be rash, however, to hold that it will never flower. In illustration of this remark, we would point to a hybrid between the Sweet Briar and Burnet Rose which grew with us on its own roots for some ten years

before it flowered. Its first effort to flower was disappointing, but its second, accomplished during the past summer of 1904, was productive of a fine mass of bloom and a large number of hips.

GRAFT HYBRIDISATION.

The hybrids we have referred to have all been produced by fertilisation of the flower of one kind of plant with the pollen



Fig. 7. *a*, leaf of Flowering Currant ; *c*, leaf of Gooseberry ;
b, leaves of Hybrid.

of another; but it is well that we should mention another method which has sometimes brought about similar results, viz. the grafting of one kind on another. The most interesting of all graft hybrids is the widely distributed *Laburnum* (*Cytisus*) *Adami*. It is stated to be the accidental outcome of budding the dwarf, shrubby, purple-flowered *Cytisus purpureus* on a stock of Common Laburnum. This happened in France over seventy years ago. There arose in the neighbourhood of the junction a shoot which bore flowers resembling Laburnum ones, but reddish in colour (fig. 8, *b*). From this shoot have sprung

all the plants of Adam's Laburnum in cultivation. Propagation is usually effected by grafting or budding it on the Common Laburnum. In place, however, of the crown of the grafted tree becoming a mass of Adam's Laburnum, there may, and do often, appear shoots of both the originals, that is, Common Laburnum



Fig. 8. *a*, Flowering branch of *Cytisus purpureus*; *c*, inflorescence of Common Laburnum; *b*, inflorescence of Adam's Laburnum.

and *Cytisus purpureus*, pure and simple. The latter forms dense tufts of twigs which look not unlike "witches' brooms" or masses of mistletoe. The originals in that position bear seed which, when sown, reproduces the respective species on their own roots; the hybrid produces only imperfect seed, incapable of germination. The Common Laburnum is naturally the strongest partner, and in many cases the other two members of the company disappear from the composite tree altogether.

MENDEL'S THEORY.

Up till five years ago the art of hybridising was in a larger measure than now empirical. General principles were, of course, obvious enough, and were followed faithfully by many workers, otherwise we could not have had the truly fine results now instanced in every garden. A new light, however, has been shed on the problems of heredity, as evidenced by hybridisation. We refer to the outcome of the labours of Gregor Mendel, Abbot of Brünn. His investigations were carried on in the garden of the convent. The results were published in a periodical so seldom referred to that they lay hidden there for over thirty years. Mendel worked out his theory for the most part with varieties of peas. He showed that there are well-defined principles exhibited by many hybrid plants in respect of the variation appearing in the progeny. In simple cases, as, for instance, when a hybrid plant is self-fertilised, the progeny of that plant will exhibit characters by which it is possible to pick out a certain number which can be relied on to breed true. Moreover, in the light of the principles enunciated, the lines of variation can so far be anticipated. It is certain that the facts reached will become of very general application in the routine work of the commercial hybridist.

Where the hybrids are sterile, or where they are best perpetuated by cuttings or other vegetative parts, the question of variation may, of course, be neglected. In illustration of this class of hybrids we may instance Potatoes, many of which, although raised from seed, refuse to bear seed in their turn, or they may even fail to bear flowers. It is usually of no advantage to a variety of Potato that it should bear flowers. Most Potatoes, like a lady famous in Scottish song, are blessed with a "lang pedigree." This is rendered patent when crosses between distinct varieties are effected. A cross of ours, between a red variety and a white one, resulted in plants which bore respectively purple, red, pink-eyed, and white tubers. Again, in the case of a white one being crossed with another white one, varieties appeared, which probably showed what some of the early progenitors were like, but which the market grower has no use for at the present day.

EXPERIENCES.

A suggestion made by the uninitiated that plant-breeding runs the risk of being overdone, is not likely to be realised just yet. From a scientific standpoint the work is exacting, and can be followed out by comparatively few. From the economic side one finds that more than the ordinary endowment of patience and perseverance is required to bring results of any real value to full fruition. Almost any hybrid is of interest to science, but special features are needed to fit a plant to make its way in the market, where its merits are measured, not by the number of theoretical points it illustrates, but in terms of the coin of the realm.

It may be worth while to refer here to experiences encountered by beginners in crossing. Mistakes arise through ignorance of fundamental facts of floral biology. On one occasion we were told of quite a galaxy of crosses in a line we had followed. A request for samples disclosed the fact that there was not a single cross in the lot. Another mistake lies in counting the chickens before they are hatched. In experimenting with Passion-flowers, for instance, one finds beautiful plump fruit, full of promise of new things. When they are opened all that one may find inside is air. Again, there is danger in relying too implicitly on seed saved of supposed crosses. It may never germinate, or the seedlings may die off early. The seed sown may grow and produce plants which, to one's dismay, may reproduce faithfully the characters of the seed parent, self-fertilisation having occurred somehow. In ordinary cases considerable care has to be taken to obviate the possibility of self-fertilisation, or insect pollination. Some hybridists, rather than take the trouble to protect the flowers worked with, prefer to spend the time in pollinating a larger number of flowers. This method has its disadvantages. Occasion is almost certain to arise for severe weeding out of seedlings, or for making larger bonfires of what is commonly called "rubbish."

It is a mistake to cross everything that happens to be about. For advancement one should choose the finest forms only, and with definite intention. One plant will be calculated to give improvement in size, another in colour, another in quality,

and so on. The blending of certain colours, good in themselves, may result in quite undesirable shades. Size may be sacrificed to substance, or beauty to fertility.

THE HYBRIDIST'S HOPE.

Where it is possible to carry on the work satisfactorily, the hybridist's calling is undoubtedly an attractive one. There is a constant possibility of something turning up which will widen the bounds of human knowledge or add to the material interests of mankind. Such successes occur often enough to keep enthusiasm going. At present a stronger wave than usual is passing over us. The hybridist's hope has been recently voiced by two outstanding workers. Mr Burbank, in a paper read at the International Plant-Breeding Conference, held at New York, says: "Plant-breeding is in its earliest infancy. Its possibilities, and even its fundamental principles, are understood but by few; in the past it has been mostly dabbling with tremendous forces, which have been only partially appreciated, and it has yet to approach the precision which we expect in the handling of steam or electricity, and notwithstanding the occasional sneers of the ignorant, these silent forces embodied in plant life have yet a part to play in the regeneration of the race which, by comparison, will dwarf into insignificance the services which steam and electricity have so far given." Mr W. Bateson, F.R.S., in his Presidential Address at the recent meeting of the British Association, touching on the same theme, said: "We may truly say that even our present knowledge of heredity, limited as it is, will be found of extraordinary use. Though only a beginning has been made, the powers of the breeder of plants and animals are vastly increased. Breeding is the greatest industry to which science has ever yet been applied."

ROSES PAST AND PRESENT.¹

By the late HUGH DICKSON, Royal Nurseries, Belfast.

No flower has withstood the vagaries of fashion like the Rose. In the early fifties Roses were quite as popular as they are to-day. In those days, and probably for many years before my time, the Camellia was perhaps the most popular flower grown, and certainly it is one of the choicest of Nature's gifts. But fashion has now relegated the Camellia to the background, on the plea that it is stiff and formal, and wanting in grace—strictures which have been passed upon it often by those who have no title to criticise in matters floricultural. No critic, however, has had the fortitude to assail the Rose; no one questions its right to the title "Queen of Flowers."

Fifty years ago Roses were, as at present, divided into sections, and probably as many varieties were grown then as now. The largest section at that time was the Gallicas. These were of French extraction, and they included many beautiful varieties, notably 'Boula de Nanteuil' and Peacock's beautiful strain of 'Louis Quatorze,' two fine crimson Roses. The Gallicas, however, were not as a rule strong growers, and propagation was slow.

Another section in vogue then was the Hybrid Bourbons. These were better growers than the Gallicas, and the best varieties were 'Charles Lawson,' sent out by Messrs P. Lawson & Son in 1855, 'Coupe d'Hébé,' and 'Paul Ricaut.'

The Hybrid Chinas, represented by 'Blairii,' 'Chénédolé,' and 'Madame Plantier,' in those days occupied a prominent position in all our winning stands, but owing to their being only summer-flowering types, they have been superseded by other and better kinds. Hybrid Chinas are still, however, to be found in old-fashioned gardens.

Fifty years ago the Tea Roses were as great favourites as

¹ Read at a meeting of the Royal Caledonian Horticultural Society, July 1900; revised for publication, 1904.

they are now, and although supposed to be a little tender they, strange to say, have held their position as well as any other section. We had then 'Niphetos,' with its beautiful paper-white buds, 'Safrano,' 'Madame Bravy,' 'Devoniensis,' and 'Souvenir d'un Ami,' and these fine old sorts are still a power in the Tea section.

Chinas were popular in the fifties, and for bedding and general decoration they are still indispensable. These have been improved very considerably by the introduction of new varieties, notably 'Madame Laurette Messimy,' 'Madame Eugène Resal,' 'Queen Mab,' 'Jean Bach Sisley,' and several others.

The Austrian Briars have undergone little change, nothing having been added to this section from 1837 to 1900, but in the last-named year M. Pernet-Ducher's 'Soleil d'Or' came as a welcome break.

During the last century the Mosses have made no advance. The old Pink Moss, dating from 1596, has never yet been excelled, and, in bud, it still remains the best Moss Rose.

Like the Mosses, the old Provence Roses, which for sweetness of perfume are excelled by none, have no change to record.

The Bourbons, great favourites in my early days, are now almost extinct, with the exception of those fine old garden sorts, 'Souvenir de la Malmaison' and 'Acidalie.'

Half a century ago the Hybrid Perpetuals were little more than in their infancy; but their many good properties, especially their free and perpetual flowering habit, and their delicious perfume, gave them a position which was soon recognised by Rose enthusiasts, consequently they rapidly grew in public favour, and soon assumed the premier position. The leading varieties then in commerce were 'Géant des Batailles,' a variety which caused quite a sensation for years, 'Lord Raglan,' 'Louis Peyronny,' 'Prince Léon,' 'Madame Vidot,' and 'Madame Rivers.' These are now nearly all gone, having served their day and generation.

In those days the mode of propagation was not calculated to foster or encourage rose-growing. All, or nearly all, were propagated from layers. Large "stool" grounds had a place in every nursery—Messrs Lawson had several acres—and from these were taken every autumn thousands of rooted, or rather

partially rooted, plants. Many of these were weak and poor, and as a result a very large percentage died the first year after planting, only those of vigorous growth succeeding.

Rose-budding was not much practised then. There were no Manetti, seedling Briar, and cutting Briar "stocks," such as we now work. The Manetti, although it had been in England for twenty years, had at that time scarcely reached Scotland. The cutting and seedling Briars, as at present handled, were unknown. The only budding done was on standard Briars taken from the hedgerows, and then, as now, the number of sorts which succeeded as standards was very limited.

When I left Edinburgh in 1855 I took with me a hundred plants of the best Roses I knew (all from layers), and a hundred small Manetti stocks. These I planted at Newtownards, the home of my boyhood, and after many years of careful work there I established from this slender stock the "Great Irish Roses."

I cannot leave this part of my subject without referring to two of my old masters—John Duguid, of Messrs Lawson & Sons, one of Scotland's best authorities on Roses, who taught me my A B C in rose-growing, and who was one of the most systematic nurserymen I ever knew; and John Lamont, of Messrs Dickson & Sons, for whose many acts of kindness I shall ever retain a grateful remembrance.

As there is no standing still in the floral world, so there is no monotony in the labours of the persevering and keen florist. Disappointments, no doubt, frequently occur, but these are softened by the introduction every year of new varieties which raise fresh hopes and add additional incentives to our labour of love. Those who have pursued the laborious, often rough and disappointing, paths of competition know well that the goal of their ambition is not reached without "hard earning."

The Roses of the past decade have undoubtedly been the Hybrid Perpetuals. They meet everyday wants and requirements, they are hardy, and with ordinary care will succeed anywhere, though no doubt the better they are treated the better will the results be. The majority of the new Roses in this section emanated from French sources; but occasionally English introductions, such as Messrs Paul's great success

'Duke of Edinburgh,' which appeared in 1868, were recorded. The French introductions, however, became most unsatisfactory and disappointing, and for a time progress was slow. About 1880, Mr Bennett, an English farmer near Salisbury, who knew something about crossing Shorthorn cattle, but little or nothing about Roses, conceived the idea that he could cross Roses, and in a very short time he came to the front as a raiser, putting our great English Rose growers in the shade. His successes were marvellous, and several of his introductions, such as 'Her Majesty,' 'Mrs John Laing,' and 'Captain Hayward,' were enough to make his name immortal among rosarians. About this time also Messrs Alex. Dickson & Son, of Newtownards, brought Ireland forward as one of the leading centres for new Roses, their introductions to the Hybrid Perpetual section—'Earl Dufferin,' 'Helen Keller,' 'Mrs Sharman Crawford,' and 'Margaret Dickson'—being marvels of hybridisation; and to the list must be added Messrs Cocker's fine Rose 'Mrs Cocker,' Messrs Cant's 'Ben Cant,' and my own seedling 'Hugh Dickson,' all of which have received the hall-mark of the National Rose Society—their coveted gold medal.

The Hybrid Tea section is an entirely new creation. The first mention of this as a separate section occurs in 1884, and it then contained six varieties, of which two only are now generally grown. The Hybrid Teas resulted from crossing of the Hybrid Perpetuals and Teas, and as a class they bid fair in a few years to outdistance all others. Their long pointed buds show the Tea character, and the delicate tinting and increased vigour the admixture of the Hybrid Perpetual, and the finest of the introductions in future may be looked for in this section. Marvellous strides have been made in improving the habit and growth, as well as the flower, of this type. 'Mrs W. J. Grant,' 'Killarney,' 'Kaiserin Augusta Victoria,' 'Marquise Litta,' and 'Lady Mary Fitzwilliam,' are some of the loveliest of the Roses belonging to this attractive section.

Since this paper was written the Hybrid Tea section has received some splendid additions, far surpassing anything which was anticipated even at that date. Such results are marvels of skill in hybridisation, and open up possibilities undreamed of but a few years ago. France, England, Ireland, and Germany have contributed to this list of beautiful Roses, and we are only now at

the flood-tide. 'Liberty,' 'Madame Ravary,' 'Bessie Brown,' 'Caroline Testout,' 'Helene Guillot,' 'J. B. Clark,' 'Lady Quartus Ewart,' 'Dean Hole,' 'Madame Abel Chatenay,' 'Étoile de France,' 'Mildred Grant,' 'Madame Jules Grolez,' 'Dorothy,' 'Frau Lila Rautenstraugh,' and many others of equal merit must convince all careful observers that the Hybrid Tea is the Rose of the future.

The Polyantha section has been enormously enlarged and greatly enriched of recent years, especially in the climbing kinds. The now well-known 'Crimson Rambler,' the pioneer of this glorious race of hardy pillar Roses, which slipped through the fingers of Scotch growers, and was eventually sent out *via* London (it was in the neighbourhood of Edinburgh for years before it reached England), has been succeeded by such valuable sorts as 'Leuchtstern,' 'Aglaia,' 'Gardeniaeflora,' 'Gruss an Zabern,' and 'Queen Alexandra.'

The Japanese *Rosa rugosa* and its varieties are from the point of view of the general cultivator plants of comparatively recent date. Where plenty of room can be given to them they are excellent subjects for the shrubbery, to which they properly belong. The finest of the newer varieties are 'Belle Poitevine,' 'Blanche Double de Coubert,' 'Madame Georges Bruant,' and 'Conrad F. Meyer.'

Of the many species of Roses available for the wild garden, few are more beautiful than the delightful Hybrid Sweet Briars raised by Lord Penzance, possessing as they do the perfume of the Sweet-briar, with delicate tints of apricot, pink, and crimson in their flowers. The section Wichuriana, which we owe to the exertions of Dawson, has opened up a new race of creeping or prostrate growing Roses which are of endless use in the rock garden, or for covering sloping banks and tree-stumps, and no species of the genus *Rosa* makes so delightful a standard as a Wichuriana.

The old Ayrshire Roses have received no additions since 1840, and now they are practically the same as our fathers knew them.

We have now in general cultivation species of the genus *Rosa* from almost every country in the world. Some of these are very beautiful, and also useful, and all are extremely interesting. We have *Rosa nitida*, *Rosa rubiginosa*, *Rosa*

lævigata, *Rosa macrantha*, *Rosa gallica*, the curious *Rosa Watsoniana*, and many others. Each and every one of these has in its own sphere a distinctive and peculiar beauty and usefulness, and we welcome them all to our gardens.

In Memoriam.

HUGH DICKSON.

To the above paper on Roses a melancholy interest attaches owing to the passing away of its genial author on the 5th of May last . . .

To the horticulturist, and to the rose-grower in particular, the name of Hugh Dickson was a household word—was, in fact, synonymous with the plants amongst which so much of his life-work lay, of which he was so successful an exhibitor, and of which he was so competent a judge. An Ulster-Scot, he was a fine representative of that intelligent, industrious, and resourceful race of people, and in his work among his favourite plants he brought to bear, with great success, those rare horticultural acquirements which he in so marked a degree possessed. Great as is his loss to local horticulture, the loss to horticulture at large is even greater, and to those who enjoyed his personal acquaintance it seems irreparable. Horticulture is so much the poorer by his death, and the Royal Caledonian Horticultural Society has been robbed of one of its most beloved and respected members, as well as of one of its most successful exhibitors. *Ars longa, vita brevis.*

HERBACEOUS PLANTS

By R. P. BROTHERSTON, The Gardens,
Tyninghame, Prestonkirk.

THE Scottish type of herbaceous or mixed border is one of straight lines—a parallelogram with the longer sides very much extended. As borders furnished with the flowers suited to this method of planting are almost always inside the vegetable or walled garden, or just outside its walls, the reason for these straight lines is apparent; they are adapted to their surroundings, a point of no little importance in flower-gardening. Instances where borders have been formed on curved lines exhibit in some cases the mistake of departing from simple outlines, the accompanying sketch of a flower border backed by a shrubbery, with grass in front, and a walk passing not far from it, showing good and bad curves.

A common error in the formation of new borders is that of making them too narrow. A short border, at the same time very wide, no doubt resolves itself into a mere flower-bed, but the vast majority of borders are of adequate length to allow for a greater width than usually exists. A narrow border, say of less than $7\frac{1}{2}$ feet, permits of little variation in arrangement, while a border of 13 to 15 feet in width is sufficiently spacious to vary every few yards in planting.

Though not essential that these borders shall have some backing, as of shrubs, hedge or wall, it is nevertheless advantageous, if for nothing else than protection from fierce winds. Borders in kitchen gardens are best backed by a hedge, preferably of Yew, systematically clipped; the Yew forming an impenetrable defence against high winds, the most destructive agents the herbaceous grower has to fear. In good soil the Yew grows fairly rapidly, a nice hedge being possible in five or six years, and a perfect one, 6 to 7 feet in height, in ten years. It has often been objected against the Yew as a hedging subject that its roots, extending across the border, abstract the fertility from the soil and leave the legitimate occupants in a semi-starved

condition. On this account Apples, Pears, Roses and other less soil-exhausting plants have been substituted. But in reality the Yew, when properly treated, is no more addicted to appropriating the sustenance of the plants it protects than any other shelter-plant. All the gardener has to do to obviate disaster is to prune the roots of the Yew as regularly as he does its

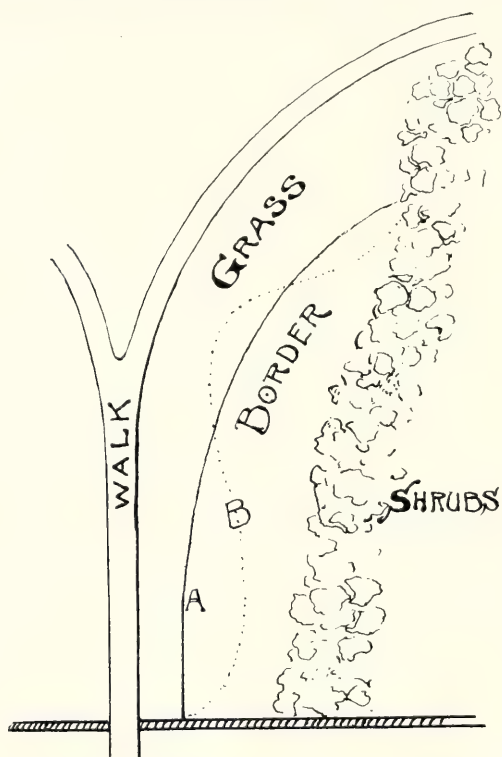


Fig. 1. A, plain line—proper contour ; B, dotted line—contour to be avoided.

shoots, with the difference that a biennial operation is sufficient to meet the case, the accompanying illustration showing the method of root-pruning best adapted to this end (fig. 2). On the vegetable side the roots are trimmed back within the bounds of the alley; and if there is no alley on the border side, the roots must be cut in a line with the face of the hedge.

Borders outside gardens are not infrequently placed immedi-

ately in front of one or other of the walls, these serving at once as a shelter and for cultivating and exhibiting the beauties of the finer and less hardy climbers.

As an edging to walks, though there are many suitable plants—*e.g.* Thrift, Pinks, Gentianella, and grass—none is quite so satisfactory as a good variety of dwarf Box. I prefer it to be square-trimmed, as being neat and at the same time unobtrusive. Desirable proportions are 6 inches high on the walk side, and not more than 4 inches wide, less than that when newly cut, as it ought to be once a year. The roots of the Box, like those of the Yew, require to be cut back once in every two

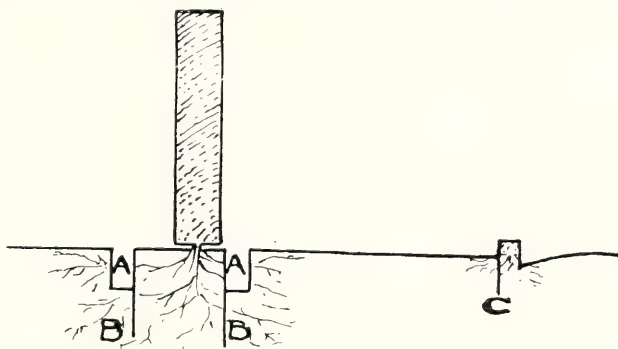


Fig. 2. A A, trench, depth and width of spade; B B, line shows where spade is pressed through soil and roots; C, Box edging with line showing cut made by spade.

years. This is effected by means of a sharp spade pressed deeply down in a line with the inner edge of the Box (fig. 2).

With regard to the preparation of the soil previous to planting, if naturally 'poor' it cannot be too thorough. It has been my fortune on two occasions to have to prepare borders with very poor soil as a basis. In both instances a clear working space was effected by excavating and wheeling away a more than usual amount of soil for what is technically called the 'opening.' After which the soil, in one instance to a depth of 3 feet, was turned over spadeful by spadeful and mixed with fresh material and rotted manure in the process, the workmen, while turning over the soil, standing in the bottom of the trench. Though a more laborious process, it is much

more effective in securing a deep tilth of fertile soil than mere trenching. Soil that has been in cultivation for a long series of years requires nothing beyond deep digging, with the addition of a proportion of rotted manure. The Tynninghame borders when prepared for replanting are merely dug—quite sufficient preparation. One point, however, must be emphasised. It is that all the plants usually arranged in herbaceous borders flourish best in a very fertile soil, consequently manure, but manure in a well-rotted condition, must be applied, not only annually, but sometimes twice a year, if one plant happens to be replaced by another. In addition to other manures derived from animals, summer surface-dressings of sifted pigeon manure are valuable; and as a further aid I employ superphosphate of lime, applied in April at the rate of one pound to every sixteen square yards of surface. In addition, when water is applied in dry weather superphosphate is added to the liquid. Pure water alone is of slight value, while the manure-strengthened water, as well as reviving the plants, acts distinctly as a food. As a means to render the soil less subject to over dryness in dry weather, and to wetness in rainy weather, it is a commendable practice to compress that newly dug by trampling.¹ In firm soil, too, plants grow less straggly, and moreover are more floriferous.

There exists in some quarters a prejudice against cultivating borders by digging while the plants are at rest, lest valuable roots should be destroyed. Where large masses of dwarf plants along with bulbs occupy every foot of the front portion of the border, digging, because of the impossibility of finding space for the entrance of a tool, is out of the question. But with the larger growing plants the case is different; and wherever bulbs are not in the way, the ground between the plants should be lightly dug and a dressing of rotted manure incorporated with the soil. Severing the roots leads to no harm; and if anyone should say that the operation is a barbarous one, put it scientifically, and say it is merely root-pruning you are about!

In arranging the plants in a mixed border I think we can do better than imitate the old-fashioned borders into which every hardy plant it was possible to secure was introduced. As

¹ Unless the surface layer be kept quite loose, a compact soil parts with its moisture much more readily than a loose one.—*Hon. Ed.*

opposed to our modern methods of rigidly selecting material, it was emphatically a collection; and one of the chief accomplishments of a young gardener in those days was the knowledge he possessed of hardy plants, accompanied with a correct memorising of their botanical names. Collections, as distinct from selections, are still cultivated, and it must be confessed that a border of this kind, if less attractive from the decorative point of view, is at the same time not without interest.

There are, too, borders furnished with a strict adherence to the principle that none but hardy herbaceous plants shall be admitted. Now, I confess to thinking it a pity to be too exacting in this matter, and see no objection, but on the contrary deem it an advantage, to admit any nice plant that might otherwise be neglected, or relegated to some obscure position where its beauty is wasted because unseen. It is a fact that in many gardens such truly delightful flowers as Sweet-Williams, Heliotrope, Marigolds, and Pinks find no place because there is found no place to grow them. Accommodation for these and others equally desirable can usually be found in a mixed border.

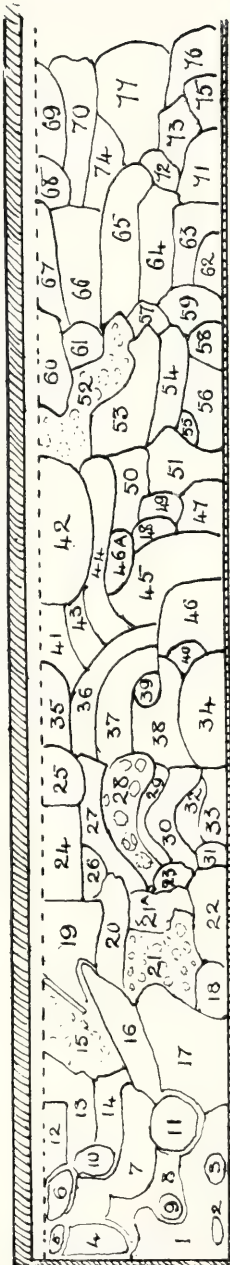
In what one may be permitted to call up-to-date arrangements, the massing of some one particular colour and its affinities finds favour with some people. Others, again, without being so particular as to colour, group all the plants in masses, but each, I think, has disadvantages that render them unsatisfactory for general adoption. We certainly need colour, especially in autumn, and massing is the best method to secure it; but in addition to colour, which appeals to one sense only, a perfect arrangement can alone be produced by giving form a place too. One Lily stem crowned with its perfect flowers is, from this point of view, as desirable as a big clump of Lilies. I would therefore urge those who are formulating a scheme of planting to fully consider this question of form, and to give it its due place in determining methods of arrangement. If this is done, such plants as Carnations, Gladioli, *Lilium candidum*, *Campanula pyramidalis*, Irises generally, *Spiraea Filipendula* fl. pl., Montbretias, Love-lies-bleeding, and *Anemone japonica* will be disposed so that their form is as little as possible obscured by other plants. This, too, gives the keynote to the whole arrangement, for if these, and plants of a kindred nature, are allotted the more prominent positions, it

is clear that those with colour only as a recommendation must be disposed in the less prominent ones, and to fill up backgrounds. In addition to these, what may well be termed first-class plants, there are others of undeniable merit of which one or two specimens is a sufficient number to grow. Such, for instance, are the species of *Eryngium*, *Statice latifolia*, and *Echinops sphærocephalus*. To exclude these and kindred subjects, if detracting nothing from the general effect of the border, certainly lessens its interest.

A large number of spring flowering bulbs can be admitted by planting them among others that flower later. Those close to the front of the border may in some instances be arranged to push through a carpet of some dwarf-habited plant. *Iris reticulata*, *I. Krelagei*, *Scilla præcox*, and *Chionodoxas* do well in this way. The larger growing plants, if not too closely planted, permit of the planting of Daffodils in the interspaces. Tulips, though equally effective, do not succeed so well, but common Fritillaries and Crown Imperials thrive planted in the same way. The introduction of only a limited number of these adds very materially to the good effect of the borders in the early part of the year, and they may be added to at any time. In planting all kinds of flowers, endeavour to diverge as far as convenient from straight lines.

As it is quite impossible to convey a clear idea of methods of arrangement in writing, many people failing to pick them up even after inspection, the accompanying chart has been prepared as being easier to comprehend. At the same time, it must be added that, arrange as carefully as one may, there is certain to be some plant misplaced which, if left, continues a source of offence. Points will be noted, too, that are deficient in effect. In these instances never hesitate to remove objectionable plants even if in flower, and replace with better, and in the same way introduce suitable plants where it is apparent they are required.

The border represented is about 15 feet in width, and the arrangement shown breaks the planting into groups with long and wide bays of comparatively dwarf plants hemmed in by those of taller and bolder growth. It is given simply as an aid, and by no means intended to be copied literally. White is largely used, and it is very important to do so, and all white-flowered plants as a rule should have prominent positions accorded them.



1. Crimson Pentstemons.
2. *Primula nivalis*.
3. *Lilium candidum*.
4. *Iris germanica*.
5. *Erigeron speciosus*.
6. *Helianthus multiflorus* fl. pl.
7. *Boltonia asteroides*.
8. *Lysimachia clethroides*.
9. *Pyrethrum* 'Carl Vogt.'
10. *Gladiolus byzantinus*.
11. *Iris pallida*.
12. *Chrysanthemum* (*Pyrethrum*) *uliginosum*.
13. *Solidago canadensis*.
14. *Achillea Ptarmica* 'The Pearl.'
15. Hollyhocks, rose, double.
16. White Phlox 'Bridesmaid.'
17. *Rudbeckia speciosa*.
18. *Thymus lanuginosus*.
19. *Aster amethystinus*.
20. *Echinops Ritro*.
21. *Campanula pyramidalis alba*.
- 21a. Sweet-Williams.
22. Dwarf *Tradescantia virginica*.
23. *Lilium candidum*.
24. *Aconitum autumnale*.
25. *Spiraea Aruncus*.
26. Blue Delphinium.
27. *Aster* 'Pluto.'
28. *Kniphofia aloides*.
29. *Galtonia candicans*.
30. *Aster Linosyris*.
31. *Mertensia sibirica*.
32. *Campanula persicifolia*, double white.
33. *Verbena*.
34. White Carnation and *Verbena*.
35. *Eupatorium Fraseri*.
36. Phlox 'Coquelicot.'
37. *Celsia cretica*.
38. *Salvia patens*.
39. *Anemone* 'Reine Charlotte.'
40. *Statice latifolia*.
41. *Lupinus polyphyllus bicolor*.
42. *Helianthus* 'Miss Mellish.'
43. *Spiraea venusta*.
44. *Aster* 'Purity.'
45. *Gladiolus Childsi*, with carpeting.
46. *Chrysanthemum* 'Gustave Grunerwald.'
- 46a. Light blue Delphinium.
47. *Anemone angulosa superba*.
48. *Helleborus maximus*.
49. *Iris florentina*.
50. Branching Larkspur, blue.
51. *Montbretia* 'Brilliant.'
52. Double white Hollyhock.
53. *Anemone japonica*, common rose form.
54. *Scabiosa caucasica*.
55. *Lilium tigrinum splendens*.
56. *Spiraea Filipendula* fl. pl.
57. *Thalictrum adiantifolium*.
58. *Saxifraga* (*Megasea*) *crassifolia*.
59. Dwarf crimson double Sweet-William.

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|------------------------------------|-----------------------------|
| 60. Aster Tradescanti. | 69. Aster Novæ Angliæ. |
| 61. Delphinium, blue. | 70. Oenothera Lamarckiana. |
| 62. Shasta Daisy. | 71. Saxifraga Andrewsii. |
| 63. Antirrhinum, florist, striped. | 72. Anemone Hepatica. |
| 64. Chrysanthemum Edward VII. | 73. Lilium candidum. |
| 65. Phlox, pink. | 74. Aster 'Lady Trevelyan.' |
| 66. Aster 'John Wood.' | 75. Campanula trachelium. |
| 67. Aconitum japonicum. | 76. Iceland Poppies. |
| 68. Scabiosa primulina. | 77. French Marigolds. |

In addition to the plants above named, undernoted is a short list of desirable plants for the border:—

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|--------------------------------|------------------------------------|
| Aconitum autumnale album. | Funkia Sieboldiana. |
| Adonis vernalis. | Galega officinalis alba. |
| Alstrœmeria aurea. | Gentiana acaulis. |
| aurantiaca. | asclepiadea. |
| chilensis. | Pneumonanthe alba. |
| peruviana. | septemfida. |
| Anemone alpina sulphurea. | Geranium armenum. |
| japonica Honorine Jobert. | sanguineum. |
| " Lord Ardilaun. | Gypsophylla paniculata fl. pl. |
| " Mont Rose. | Helenium pumilum magnificum. |
| narcissiflora. | Heliopsis scabra 'Ernest Ladhams.' |
| Anthericum Liliago major. | Helleborus niger angustifolius. |
| Armeria Cephalotes. | odorus. |
| vulgaris alba. | Hemerocallis 'Apricot.' |
| Astilbe chinensis. | aurantiaca major. |
| " Davidiana. | flava. |
| Thunbergii and varieties. | fulva. |
| Bocconia cordata. | Heuchera brizoides gracillima. |
| japonica microcarpa. | sanguinea. |
| Bupthalmum salicifolium. | " alba. |
| Campanula carpatica. | " cylindrica. |
| garganica. | Incarvillea Delavayi. |
| grandis alba. | Iris, English. |
| " Van Houttei. | Spanish. |
| persicifolia and varieties. | pallida and varieties. |
| pusilla alba. | pumila and varieties. |
| urticifolia alba fl. pl. | sibirica. |
| Catananche cœrulea. | stylosa. |
| " alba. | " alba. |
| Cimicifuga racemosa. | Kniphofia caulescens. |
| Clematis Davidiana. | Macowanii. |
| Commelina cœlestis. | rufa. |
| Coreopsis grandiflora. | Tuckii. |
| Cuphea strigulosa (not hardy). | Lilium canadense. |
| Dianthus deltoides. | croceum. |
| " alba. | chalcædonicum. |
| 'Fettes Mount.' | Martagon. |
| 'Charles II.' | " dalmaticum. |
| Erigeron mucronatum. | pardalinum. |
| Eryngium amethystinum. | Lychnis alpina alba. |
| giganteum. | chalcædonica, double red. |
| Oliverianum superbum. | fulgens. |
| planum. | Viscaria splendens. |
| Francoa appendiculata. | Lythrum Salicaria superbum. |
| ramosa (not quite hardy). | Monarda didyma. |
| souchifolia. | fistulosa alba. |

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|--------------------------------------|----------------------------------|
| Montbretia (Tritonia) 'Anneau d'Or.' | Ranunculus amplexicaulis. |
| 'Eldorado.' | Rudbeckia californica. |
| 'Feu d'artifice.' | purpurea. |
| 'Germania.' | Sanguisorba canadensis. |
| 'Incandescent.' | Scabiosa caucasica alba. |
| 'Lothario.' | taraxacifolia. |
| 'Messidor.' | Sedum spectabile. |
| sulphurea. | Scilla nutans alba. |
| 'Toison d'Or.' | Sidalcea Listeri. |
| 'Tragedie.' | Spirea kamtschatica gigantea. |
| Oreocome (Selinum) Candollei. | palmata elegans. |
| Orobis vernus. | Ulmaria fl. pl. |
| Papaver orientale 'Blush Queen.' | Tiarella cordifolia. |
| " 'Salmon Queen.' | purpurea major. |
| Pentstemon barbatus. | Trollius Fortunei fl. pl. |
| Phlomis samia. | " napellifolius. |
| Polygonum amplexicaule oxyphyllum. | Veronica longifolia subsessilis. |
| Brunonis (affine). | spicata. |
| Ranunculus aconitifolius fl. pl. | " alba. |
| acris fl. pl. | " rosea. |

MODERN BEEKEEPING—ITS HELPS AND HINDRANCES.

By the Rev. J. W. BLAKE, M.A., President of Midlothian
Beekeepers' Association.

IN complying with the request to write something on bee-keeping for a publication connected mainly with horticulture, one naturally looks at the matter first of all in its relation to the flowers of our fields and gardens. Every one who has looked into botanical matters knows what a close connection exists between bees and flowers, and how mutually dependent they are on one another. The most careless observer cannot help being struck with the wonderful diligence of the bee as it pursues its unremitting task, and while it accumulates a store of food, also carries from one plant to another the fertilising pollen which enables many various plants to produce fruit and seed. There is no more interesting and instructive subject of investigation than the mutual relation of insects and flowers; for in pursuing it we are brought face to face with an endless succession of wonderful adaptations and numerous instances of the marvellous provisions of Nature for carrying out her beneficent purposes.

In apiculture (or beekeeping) we have ample opportunities of following out these engrossing subjects, for in no department of knowledge do Nature and science go more happily and usefully hand in hand.

The keeping of bees for the sake of their honey has been practised from the earliest times. In the classical writers of Greece and Rome we find many references to this pursuit, and one famous Roman poet (Virgil) devotes a long poem to the matter of profitable beekeeping.

It has been left to a later age, however, to go into this subject on the lines of scientific procedure, and with the aid of past experience to lay down the laws which are now generally accepted as being at the foundation of all successful beekeeping.

The old system, under which bees were killed off at the end

of the season in order to secure the honey, was at once a cruel and an expensive one. We can well remember in our boyhood the scenes which were often enacted when the bees were to be 'smeekit.' A hole was dug in the garden, and the doomed bees were held over it until the fumes of burning sulphur had stupefied and asphyxiated every unfortunate inmate of the skep. This holocaust having taken place, the honey was dug out of the skep, often in ancient combs, mixed up with pollen and young brood, altogether an unsightly mess. It was possible, no doubt, to get pure uncontaminated honey in 'bonnets,' or small skeps placed on the tops of the larger ones, but a great deal of the honey secured at the end of the season was of the uninviting nature which we have described. According to the modern system, we gather our honey without the loss of a single bee, and it is stored in neat cases or sections, or in bottles of pure liquid extracted from the comb. These improvements, and many others, are due to the substitution of the bar-frame hive for the straw skep. The skep, no doubt, formed a very snug and comfortable home for the hive bee, but it had many inconveniences. It was impossible to tell what was going on inside it, or at what stage the stock of bees had arrived. The size of the hive remained always the same, and could not be varied according to the number of its inhabitants.

These difficulties, and others which we cannot enlarge on here, have been overcome by the plan of inducing the bees to build each comb in a separate frame. This is the fundamental principle of the frame hive. Another advantage gained is the entire separation of the brood-nests from the surplus honey. With proper management and the use of the 'queen-excluder,' we can harvest our honey without a single cell being contaminated with pollen or brood.

It must be felt by all beekeepers, however, that even with the best and most modern appliances beekeeping, like 'gowff,' "taks a heid." In other words, without careful and thoughtful management, your hives, in an average season, will not leave you much profit.

In our opinion the great maxim for beekeepers is, "Keep your hives strong." A great row of weak hives is utterly useless, whereas a few strong stocks may give you a big surplus. For this end attention must be given to the proper wintering

of our stocks. If they only struggle through the winter with difficulty, they will take a long time to get up their strength in spring. Abundant food and sufficient warmth are the essentials for proper wintering.

The number of frames should be reduced to six, and the space between the division boards and the sides of the hives packed with cork-dust filled into cotton bags. Above the frames about four inches of cork dust should be placed in an empty section crate, with a piece of cloth nailed on it to retain the dust. Thus a splendid non-conductor surrounds the bees and enables them to keep up the required temperature without much effort. Before finally shutting down at the end of the season, we must satisfy ourselves that our bees have enough store to last through the winter, and well on into spring. A fortnight's steady feeding with syrup will put everything right, and a cake of bee-candy may be added to "make assurance doubly sure."

Early spring is often a critical time. A mild day in March should be taken advantage of to peep into the hives (merely uncovering the end of the frames) in order to see if food is still in sufficient quantity.

If, after all, some stocks are weak and backward in the end of April, unite them; they will do far better work as one than as two.

'Spring stimulation' has a wonderful effect in bringing hives up to full strength. This is effected by giving a small but regular supply of food (syrup), and gradually enlarging the brood-nest by inserting frames of fresh comb or foundation into the centre of it, care being taken to proceed cautiously.

By this process we induce the queen to start egg-laying earlier and to keep filling up the empty cells which are put at her disposal. The result is that if you wish swarms you get them (or force them artificially) at a much earlier period, and consequently your hives will be ready when the honey flow comes on to take full advantage of it. If you wish to discourage swarming, be sure to give your bees plenty of room for storing surplus, and by means of ventilation and shading, keep down the temperature as much as possible in warm weather.

Re-queening of the hives is a matter of importance, and most advanced apiarians raise their own queens and replace older

ones every year. Young queens are raised by special methods, and are introduced into the hives from which the former mothers have been removed. By introducing a fertile queen into a hive from which a swarm has gone or been taken off, we do away with the interregnum which takes place between the departure of the old queen and the fertilisation of her successor.

The question as to the best varieties of bees is one that has been much debated. On the whole, it must be conceded that the native or brown bee is best adapted to the conditions which prevail in this country. No doubt other species may be advantageously crossed with it. Much has been done to improve the strain of bees by hybridising, and it is doubtful if the native bee is now to be found in its original purity. The principal varieties which have been introduced into this country are the Ligurian or Italian, the Cyprian, the Carniolan, and the Punic or North African.

The Ligurian bees are very prolific, and being mild in temper, are easily handled. They are very diligent honey gatherers, but the appearance of their comb is not equal to that of the native bee. The Cyprians are splendid foragers, and are noted for their enormous fecundity. They winter well and build up their strength quickly in spring, but they are apt to produce a quite unnecessary number of queen cells. The crosses between all the species mentioned and our native bees produce good workers, and are able to stand the severity of our climate better than the fine foreign breeds. In one respect the native "excelleth them all," *i.e.* in the beautiful finish and purity of her comb, which is, when sealed, of a snowy whiteness, and is better able to resist damp than any other.

The flowers from which the bees draw the sweet nectar which is stored in their hives are many and various, and range from those of the humblest weed to those of the lofty Limes and Planes.

There are, however, only a few kinds which afford a large supply. The Plane tree puts out its clusters of blossom along with its leaves, and in the end of May these trees are sought out by myriads of bees, who draw a large revenue from them. Coming at a time which is very critical in the life of the hive, when the winter store is at its lowest ebb, this honey does a great deal to stimulate the bees to renewed energy and the

queen to making large deposits of eggs. The main source of supply comes, however, from the White Clover, though in some districts fruit trees afford a considerable quantity of nectar. In places where Sainfoin is grown, delicious honey is obtainable from this plant, far exceeding Clover honey in its aroma and flavour.

Heather honey takes first rank over all others in the market. When August throws its purple mantle over our hills, the bees reap a bountiful harvest from the Heather, and certainly for richness of flavour and beauty of appearance Heather honey is hard to beat.

The ideal situation for an apiary, then, would be in a district where all these sources could be tapped in their season; where fields and trees and hills combine to afford a spacious foraging ground for the little rovers.

There is one essential to profitable beekeeping which unfortunately has been lacking in late years, and that is favourable weather.

We may have the best of hives, stocked with healthy and overflowing populations, and situated in the most favourable locality, but unless the weather is such as to promote the secretion of the honey-producing fluid in the nectaries of the flowers, all these advantages will be as nothing. In cold dull days the bees are well aware that it is no good for them to venture abroad, for their quest would be in vain. Now the last seasons (1902-3-4) have been of such a nature that in most localities, in Scotland at least, very little honey has been produced. In the season now closed the present writer found, in an exhibition where he was judging, not a single section of clover honey, and from inquiries made it seems that this species of honey is almost an entire failure. In 1903 we had one of the finest blooms of Heather on our hills that has ever been seen, and yet the result in Heather honey was miserably poor.

High winds, frequent rain-storms, and a low temperature combined to prevent the bees getting an opportunity to fill their combs, and most hives returned from the moors very little the better of their autumn visit.

All that we can do is to hope for better times, and to keep our stock in a strong and healthy condition so that they may be ready to profit by every opportunity.

Many stocks perish every winter from insufficient protection and from lack of food. A little carelessness may well-nigh wreck a whole apiary. Disease is apt to gain an entrance to weak, dirty hives, and once it gets a hold, may prove very destructive. The terrible malady known as 'foul brood' has been known (as in Berwickshire some time ago) to clean out most of the stocks in a countryside.

A very useful pamphlet is issued by the Board of Agriculture giving a description of 'foul brood' and its symptoms, and also directions for its treatment. The safest plan is to commit hives and stock to the flames, after suffocating the infected bees with sulphur. If a colony is found to get suddenly very weak, an examination should be made at once; and if it is found that a strong sickly smell proceeds from the hive and that the young bees have died in the cells and form a sticky dark brown mass, it may be safely concluded that the fell disease is there. Brood that has perished from exposure to cold shrivels up and becomes dry and grey without having any disagreeable smell. The infection from 'foul brood' quickly spreads owing to the strong hives robbing the weak ones, and carrying with them the microbes of *Bacillus alvei*. Mr Cheshire has proved by careful researches and microscopical investigations that the bacillus of this disease is to be found not only in the blood of infected bees, but even in the eggs while yet in the ovary of the queen. It is believed that the disease was originally brought into this country by the importation of infected queens. In slight cases it has been found possible to effect a cure by spraying with phenol and the use of medicated syrup, while thoroughly disinfecting the hive by painting it with a mixture of carbolic and methylated spirits. The safest plan, however, is to 'put down' every hive in which 'foul brood' has got a hold.

In conclusion, we may remark that modern beekeeping, like every other true science, strives to assist natural forces and tendencies, and to direct them in such lines as shall cause them to be of the greatest utility.

By a careful study of that most marvellous insect the honey-bee, we can discover when and how to develop its powers and to check its idiosyncrasies, in order that it may yield for our use the largest possible amount of its sweet produce.

POTATO PROBLEMS AND DEVELOPMENTS.

By WALTER P. WRIGHT, Secretary of the
National Potato Society.¹

MR WRIGHT said he should first like to put before the meeting the demand for the Potato in a very few words, and then to show what he considered were the best ways of meeting that demand. Let him just briefly remind them that in Great Britain there were cultivated about 570,000 acres of Potatoes, and that in Ireland there were cultivated in 1904 about 620,000 acres. They might say, roughly, that the acreage was 1,200,000, and, giving an average of six tons to the acre, that meant approximately that they had growing at the present time seven million tons of Potatoes.

What was the value of the crop? If Potatoes could all be assessed at the sensational figures they had all heard and read about during the past few months, he should say that they would reach a million pounds per ton; but he had been a little more modest, and had taken the price at £3 a ton. That meant that the Potato crop in the United Kingdom might be worth £20,000,000. It was a large sum, and it was not unlikely to increase. In all probability the demand for Potatoes would grow in two or three ways—in the first place, by the natural increase in the population; in the second place, by the increased attention paid to the crop; and in the third place, by increased industrial uses.

A Royal Commission had just been appointed to consider the question of the utilisation of duty-free alcohol. That had very great bearings on the Potato—a much greater bearing on the Potato than they might at first suppose. The price paid for Potatoes for industrial purposes in Germany was exceedingly low—on an average 25s. per ton. That was not very tempting, but anything that led to a demand for Potatoes was worth

¹ Lecture delivered under the auspices of the Royal Caledonian Horticultural Society, 14th September 1904.

consideration, and they might therefore hope that something would result from the work of this Commission which Mr Austen Chamberlain had just appointed. However, they could fairly well leave that out of consideration, and they could ask themselves whether they could do more than they were doing to reap the benefits from the six or seven million tons of Potatoes which were now called for to meet the wants of our own population. There had been a very great growth in the price of Potatoes during the past twelve months—indeed, such a growth as the world had not witnessed before. The question was, whether interest was likely to be maintained, and, if so, how were the Potato growers to reap the utmost advantage from it? He assumed he was talking to those who grew Potatoes for profit, and therefore he wanted to point out what were the particular things they required to do in order to keep the prices, if not up to the level at which they stood, at all events beyond the old unprofitable level of some years ago. The seed trade proper had not the bulk of the Potato ‘seed’ trade in its hands; the Potato ‘seed’ trade was largely in the hands of the farmers. It was so in England, and he supposed it was also the case in Scotland. Probably the farmers would prosecute the advantage they had got in connection with that position, and try to keep the Potato ‘seed’ trade where it stood at the present time. He should like to utter a few words of warning about what was called the Potato “boom.” He did not think they must expect to keep Potatoes at the prices they had been sold at during the past few months. He did not for a moment think that could be done, but he thought it was quite possible to keep the prices at a very profitable figure. There were one or two phases of this boom that were not altogether desirable. It was natural when a commodity suddenly became very inflated in value that a large number of people turned their attention to it. Many of them were laying hold of Potatoes and trying to do with them that which might presently lead to trouble. He should like to impress upon growers of repute the very great importance, now that the trade had got into a profitable position, of sending out only the best novelties and watching them with the greatest care. The temptation existed for unscrupulous persons to take hold of Potatoes raised by other people and to put them on the market under other names.

He need not, in addressing respectable dealers, ask them to avoid it. But he would ask them to look out for this practice in other dealers, and do their utmost to keep it down.

With regard to the question of the rapid propagation of expensive sorts, he thought the mere rapid propagation of a Potato in itself was not fatal, provided the methods by which the propagation was secured were sensible ones. But now, addressing a word particularly to his farmer friends, he would ask whether in this particular direction they could not derive a little help and advice from the gardeners. This year various well-meaning people got hold of tubers of 'Eldorado' and put them in warm greenhouses. So far nothing terrible happened. But the Potatoes were put in the greenhouses far too early, and the sprouts were forced. In one particular case a grower told him that he got thirty-seven sprouts from one eye, and he told him also of the immense area he was going to cover with the produce of this Potato. He did not doubt it would have covered the area of Edinburgh—if the plants had not died! To put Potatoes under glass and transfer them to the open without any special hardening or any special attention was utter folly. They could make a Potato even more tender than it was by nature, but they could not afford to dispense with the hardening; and if they did, then the Potato would fail. Let him therefore impress upon them the great importance of care in this respect. There was no reason why the Potato should not yield more produce than it did at present, and there was no reason why they should not get more than one plant from a single eye. The mere getting of more than one plant from one eye of the Potato was in no way harmful to the tuber, or to the constitution of the plant. He would not go so far as to say that he would include the propagation by stem cuttings. He thought that was going a little too far.

The early part of February was too early in the season to begin to plant Potatoes, and if the growers planted later they would get immeasurably better results. Supposing they had none of this under-glass propagation, and were going to treat their Potatoes in a rational manner, he advised them to begin by the early selection of 'seed.' To his mind it was a very serious reflection upon Potato growers that they paid so little attention to the 'seed' in the autumn. He did not know of any com-

modity cultivated where the 'seed' was treated in such a scandalously careless way as the Potato. From experiments made it had been shown that there was a difference of £2 per acre in favour of treated 'seed,' and he hoped they would agree that the suggestion that the Potato 'seed' should be looked to in the autumn was a practical one. With regard to the cutting of Potatoes, there was no reason why, with the vast majority of varieties, they should not sprout them, cut them into as many pieces as they had strong sprouts, and get good results from them.

There was another small direction in which the farmer might learn from the gardener in connection with these very highly developed sorts and these very expensive varieties, which they were very anxious to propagate, and that was in giving particular attention to the soil. Hundreds of pounds were expended on new varieties, and shillings were grudged on the formation of proper beds. A piece of trenched ground would double or treble their crop the very first year they practised trenching. He was not advocating trenching for 400 or 500 acres, but only in the case of a special variety. But, when all was said and done, 'seed' was the bed-rock of success. They could not, he thought, give too much attention to it.

Some time ago a very interesting paper was delivered by a South of Scotland grower on the question of early varieties, and in particular on the question of immature 'seed.' The question discussed was—Was it to the advantage of the Potato grower to use unripe 'seed' or ripe 'seed'? The contention of Mr Wallace, of Dumfries, was that unripe 'seed' gave the most vigorous plant, and healthier and more productive crops than ripe 'seed.' In connection with this, there were certain interesting facts which they had to face. Where did they find the oldest Potatoes? Was it amongst the early or late ones? He thought they would agree with him it was amongst the early Potatoes. Many of the early Potatoes that were grown fifty years or more ago were good Potatoes still. There they had Potatoes lifted in a comparatively unripe state lasting a great deal longer than the later ones, which were lifted in a mature state. It might be said that the early varieties were not subjected to disease. They had not to stand the stress and turmoil of the whole year, and that was the reason they had kept themselves strong. Well, he spoke to them as one who had made no experiment in that

direction, but as one who had read the evidence on both sides, and he thought Mr Wallace had very great weight of experience behind him in advocating as he did the use of immature 'seed.' It was a matter well worthy the attention of Potato growers. As to the actual planting of the great bulk of the Potato crop, he thought growers planted their Potatoes, except in the case of the early varieties, far too early. He most strongly traversed the idea that late Potatoes must necessarily be planted early and pushed forward early. He was of opinion, from experiments he had made, as well as from other observations, that early planting was in the main not an advantage but a disadvantage, and he thought they might with great advantage and profit defer their planting to a much later period than was generally adopted at the present time. The question of manuring was a very important matter, and with the large number of experiments that had been conducted he thought they had arrived at a fairly correct idea as to the manurial requirements of the Potato. On his stiff soil he found that the ideal manure was cow manure, supplemented by a light dressing of kainit to give the potash that was required. He thought they might fairly use from fifteen tons to twenty tons of cow-yard manure to the acre, and if this were supplemented by five cwts per acre of kainit, he thought they might get almost an ideal mixture at a very moderate cost indeed.

Referring to the question of diseases, he mentioned, with regard to the 'curl,' that until the last year or two he looked upon it as a new disease. But a copy of the Government report which was drawn up and issued a hundred years ago had come into his hands; and this report, which was by far the most interesting book on Potatoes he had come across, referred to the 'curl' as a troublesome disease in Scotland more than a century ago. Stress was laid on the trouble that was caused by the 'curl' in low-lying lands, and of the great advantage that accrued from the change of 'seed' from a higher altitude. Let him just say that he thought this little point about change of 'seed,' which was advocated in that old book, stood to-day with the same weight and importance as it did in the days when Sir Walter Scott walked the streets of Edinburgh. Change of 'seed' was the most vital thing in connection with modern Potato culture. He confessed that, as an Englishman, he had been impressed

somewhat painfully, not by the emphasis which Scottish growers had laid upon it, but by the fact that it worked all one way. They had come to the conclusion that the change from Scotland to England was first-class, and that the change from England to Scotland was no good! This change of 'seed' from north to south was more than a change of soil. It was very largely a question of atmosphere. He thought that the Potato having to struggle against the rigorous climate of Scotland must develop in it a more vigorous constitution than those cultivated across the Border. Well, change of 'seed' stood first. Then they should go in for later planting; and with regard to the 'curl,' he thought its development was partly due to over-ripe seed in dry summers, and partly to early planting and the crippling of the growth in the early stages. He could say much more, but he must conclude with a few words about varieties. Of course their number was legion, and every year it grew more and more rapidly. He wanted to call attention to a few of those which in trials had proved to be worthy of attention.

There was the 'Eldorado.' The stock was so limited that they must still take it to a certain extent on trust. It was a variety that would develop in the future. What was going to take the place of 'Up-to-date'? In 'Up-to-date' they had the greatest Potato of all time. Mr Archibald Findlay's 'Northern Star' was a Potato which seemed likely to become of great importance and of great value. At present the acreage was not great. His experience of Sutton's 'Discovery' had been somewhat limited. He had only grown two or three rows, and at present he was marking time. He wanted to see more of it. The 'Duchess of Cornwall' was a Potato which they must put down as one of their special lines. It achieved a considerable amount of success in Ireland this year, and wherever he had seen it this year it had always been well spoken of. 'The Factor,' another Scottish variety, and a cross between 'Up-to-date' and 'Abundance,' had been found valuable. 'Diamond,' which was of the same parentage as 'The Factor,' had a white bloom, and had much of the growth of 'Up-to-date.' 'Lord Dundonald,' which he was told was synonymous with 'Charles Fidler,' gave a better crop, and was a Potato worthy of attention. For second earlies, 'British Queen,' with white blossom, and 'Royal Kidney,' which seemed very reluctant

to produce any blossom, were exceedingly valuable Potatoes. 'King Edward VII.' was a Potato in which he felt a paternal sort of interest, because it had come to the front in Lincolnshire, the county of his birth. 'Sir John Llewelyn' was a very promising Potato, and he did not doubt that they had proved its value in Scotland. Of 'Lymm Gray,' his experience was that it was poor on clay, but good on light soil. 'Warrior' was a Potato with which he was very much struck. It was of fine full growth, very productive, and of good flavour. 'Ever-good' had not been giving satisfaction, but was good on clay. As for 'Gold Coin,' which he grew on a small scale, he would sell the produce at twopence a ton with pleasure. It was the ugliest Potato he had ever seen. 'Farmer's Glory' was a magnificent Potato on clay. It cropped plentifully and was remarkably vigorous, but it never seemed to have caused any sensation. 'Empress Queen' was a Potato of high repute. He hoped someone would stick up for it—he could not praise it for stiff land. Bryden's 'Crampton' was one of the finest Potatoes he had ever grown. 'Conquest' was very impatient of cutting. 'Maid of Coil' and 'Southern Star' were also fine Potatoes. As to the earlies, he could not put 'Sir John Llewelyn' first, because it was not the first early in his garden. 'Ninetyfold' and 'Duke of York' were earlier, but 'Sir John' was a splendid second early. A very great demand existed for high-class early Potatoes, one of which was called 'Recorder.'

In conclusion, Mr Wright asked them to view with interest and sympathy the work of the National Potato Society, an organisation which was formed at the suggestion of Mr William Cuthbertson, of the firm of Dobbie & Co., of Rothesay. It was a living organisation which felt the responsibility it assumed, and an organisation which had ambitions. It had made a wonderful start, but they wanted to have a wonderful development. They could not consider that a Potato Society was in any way complete unless its list of members included a very large number of the Potato growers of Scotland.

In the discussion that followed, Mr McLaren, Ballencrieff, Longniddry, agreed with Mr Wright that change of 'seed' was a good thing, and said that the reason why greater quantities of 'seed' were not taken from England was because of the stiff prices that were sought by the dealers in England.

Mr Thomas Smith, Stranraer, asked whether the over-propagation of 'seed' Potatoes in this country had a bad effect on the ultimate tuber.

The Chairman said the suggestion that they should have hothouses for the preservation of 'seed' struck him as rather singular. The recommendation in favour of immature 'seed' seemed to him also rather singular.

Mr Davie, Haddington, asked the lecturer if he had any experience of the disease called *black rot*, which was very common in 'British Queen.' As to the question of immature 'seed,' he thought that 'seed' and everything they wished to grow should be matured. Therefore he did not believe in immature 'seed'—that was, Potatoes lifted green and ripened in the bed or in baskets. Treated thus, there was a great tendency to heating, and if they had heated Potatoes they had no result except misfortune. The reason why Scottish-grown 'seed' did better than English 'seed' was, it had occurred to him, not due to soil and climate alone, but to the longer summer day. They knew the Potato was a sun-loving plant. The more sun it got the better it ripened, and if they managed to get it ripened by the aid of long summer days, then it would be a stronger and healthier plant. The question of ripening was a very difficult one to tackle. They knew quite well that the Potato 'seed' they planted was not a seed, but a tuber. He held that it was practically a cutting, for if they cut it into so many separate eyes they got a plant from each. Being a cutting, then, he thought it should be a matured one. If they had their Potatoes well ripened they had a better chance of getting a strong constitution in them. He did not plant early.

Mr T. A. Scarlett, Edinburgh, said that with regard to the question of immature 'seed' Mr Wright and he were mostly at one. He was out-and-out a believer in immature 'seed.' He had been very successful in raising 'Eldorados' from the leaf alone, a thing that had been done by taking the leaf when very young. He was entirely opposed to growing from the sprouts. By growing from the young stems they could get twenty times more. With regard to immature 'seed,' they must be very careful, because immature 'seed' was liable to heating. If they took immature 'seed,' put it in a box, and then planted it, they

would have, if they exercised due care, an earlier and a better crop of Potatoes. That also applied to late Potatoes.

Mr Varlow, Lincolnshire, said the difference in the price of the 'seed' they got from Scotland and what the English growers wished to send back did not arise with the English farmer, but with the English seed houses. If their Scottish brethren wrote to some of the farmers in England, they would be very pleased to let them have their 'seed.' In fact, they would "swop" 'seed' for 'seed.'

Mr G. M. Taylor, Pinkiehill, Inveresk, asked by the Chairman how the Potatoes exhibited before the Fruit and Vegetable Committee that day were grown, said that all the Potatoes that were shown by him at the Royal Caledonian Horticultural Society's show that day were grown from immature seed. This year he sent to some of the leading seedsmen in England for 'seed' of several particular varieties. He got three varieties from one seedsman. One was grown in Scotland, and the two others in England. The variety grown in Scotland turned out a very heavy crop. Of the others, one was a complete failure, and the other was a comparatively good crop, but, at the same time, with a good many blanks. The 'seed' did not spring. Those two lots were from English-grown 'seed.'

Mr Fife, of Dobbie & Co., Rothesay, said he dared say some of the experiences of Mr Wright might vary with the experiences of growers in other parts of the country, because they found that a variety which was a success in certain lands might be a complete failure in other lands. When he was resident in Kent he made a series of experiments with several varieties. He believed that in the chalky soil of that part of Kent the chalk had a detrimental effect on some varieties compared with what the rich loamy soil in other parts of the county would have had. Although they tested, they must not take the result as a conclusive proof either of a bad or an extremely good variety until they knew more about the circumstances.

Mr Gordon, V.M.H., London, said the question raised by Mr Fife was one of considerable importance. What they wanted in connection with the Potato, as with some other things, was experiments conducted on precisely the same lines in different parts of the country, in different soils and different climates. Then when these various reports were collated they could arrive

at something like correct conclusions as to what the variety for certain soils and districts was, and the best manures to use in those particular soils. He remembered advocating this view at the Royal Horticultural Society some six years ago, and he was thought to be somewhat of a faddist; but he was glad to know that the importance of co-operative experiments was now beginning to be recognised, and he was especially glad that it formed a leading part of the work of the National Potato Society. He regarded an exhibition as of the utmost value, but he also regarded the work they were engaged in, conducting trials in various parts of the country, as of the first importance in the matter of profitable Potato culture, and he did hope that the Society would receive that measure of support that would enable it to extend those trials in other directions and on a wider basis. Mr Wright had mentioned that it would not be feasible to trench 400 or 500 acres of land. But there was no doubt that even on very large areas deep cultivation would pay. If it paid for one acre, he was quite certain that it would pay for 500 acres. They knew that in earlier years he was engaged for some years in Potato cultivation, or rather had the management of Potato cultivation on a large scale for commercial purposes. They had crops of twelve and thirteen and fourteen tons to the acre, which was some four or five tons more than their neighbours. All the land was subsoiled in the autumn, so as to give the Potatoes a good deep root-run. They manured liberally, and the cost of the trenching was more than repaid by the heavier crops.

Mr W. P. Laird, Dundee, referring to the Potato exhibition that was to be held in London under the auspices of the National Potato Society, expressed the hope that occasionally the show might be held in Edinburgh.

Mr Wright, replying on the discussion, said, with regard to propagation, there need be no deterioration if the plants were carefully cultivated, but he did think as time passed they might naturally look for a shorter period in the life of Potatoes. With respect to houses, he did not advocate heated houses for the care of the 'seed.' He only advocated the least possible amount of heat as a little protection in order to keep them fresh. He was familiar with what they called *black rot*. They should watch the 'seed' very carefully, and if they should notice a little black patch

near the eye, it would be well to reject it. He would remind them that Mr Wallace stated that he had made some careful experiments of his own, and was convinced that immature 'seed' was best. He observed that Mr Davie supported his contention with regard to late planting. It was a very great satisfaction that an experienced Scottish grower should agree with him on that point. Though they might not be able to hold an exhibition entirely on their own account, he hoped at some future date they might be able to come to an arrangement with the Royal Caledonian Horticultural Society, and have a representative show from all parts of Scotland and England. He was encouraged in that hope from the fact that he observed a great inclination on the part of the Royal Caledonian Horticultural Society to do experimental work. He had a preliminary schedule for 1905 in his pocket, and it was with peculiar pleasure that he noticed the attention devoted to experimental classes. That was a thing in which they had set an example to them in England. It showed a progressive spirit, and that was a thing that they should like to foster.

Mr P. Murray Thomson, S.S.C., proposed a vote of thanks to Mr Wright for his interesting lecture.

Mr Blanshard, Lincolnshire, seconded, and the motion was cordially passed.

Mr Wright acknowledged in a word, and the proceedings thereafter terminated.

CLASSIFICATION OF APPLES.

By P. MURRAY THOMSON, S.S.C., Secretary and Treasurer,
Royal Caledonian Horticultural Society.

“DISQUALIFIED!” To find this word written on an exhibitor’s card is a bitter experience which fortunately comes to most exhibitors but rarely. The numerous individual classes for Apples (including over forty varieties) which for some years have been included in the Royal Caledonian Horticultural Society’s Autumn Shows were originally prepared for the purpose of, and have since done good service in, showing how varieties grow in certain districts, and in correcting the naming of a considerable number of trees. It has been a common experience to see visitors to the Shows carefully searching the exhibits for Apples to compare with one or two specimens they have brought in their pockets. It has also been a common experience, now fortunately becoming rare, to find more than one variety staged in the same class, with the distasteful word “Disqualified” on some of the cards. In the latter case the disappointed exhibitor probably protests that he has exhibited the produce of the same tree in the same class for several years without being disqualified—no guarantee that his exhibit was right—or that he got the trees from some respectable firm of nurserymen under the name now said by the judges to be wrong. In general appearance the two Apples may look so much alike as to escape the notice of any but experts, yet they may have very diverse hidden characteristics, and various attempts have been made to devise a classification for the Apple which would facilitate the identification of the numerous varieties. In his *Fruit Manual*¹ Dr Hogg fills nearly 250 pages with descriptions of varieties grown in the gardens and orchards of the United Kingdom. Such attempts at classification have been made by Diel, Sickler, Dochnahl, Lucas, and others; but that pre-

¹ *The Fruit Manual: A Guide to the Fruits and Fruit Trees of Great Britain*, by Robert Hogg, LL.D., F.L.S. Fifth edition, 1884. *Journal of Horticulture* Office, London.

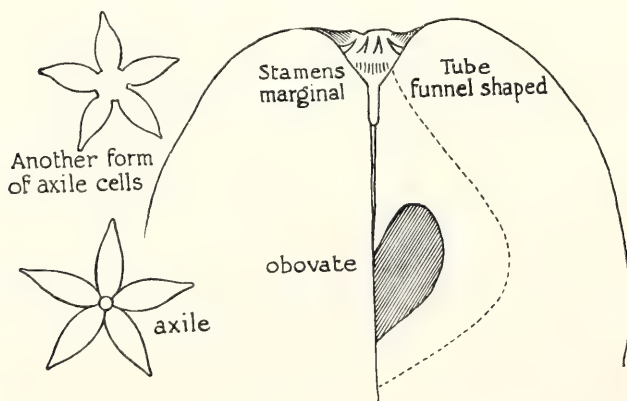
pared by Dr Hogg appears to be the most reliable, though from it we cannot—and Dr Hogg himself did not claim that he could—identify all the varieties. Yet, if one variety is asked for, and it and others are staged, it appears to be quite possible from his classification to determine which are the true examples of the variety.

Dr Hogg based his classification on the structural characters of the fruit—1, the stamens; 2, the tube; 3, the carpels; and 4, the sepals. If an Apple be cut through from the centre of the eye to the stalk these organs are all seen, and upon a proper knowledge of them depends the understanding of the minute descriptions which have been drawn up for the various varieties.

There is no intention to make this paper so complete as to cover all the points included in Dr Hogg's notes, but merely to indicate what may be still to many an unnoticed field of interesting study, and to others the key to his descriptions. This may be most conveniently done by comparing two fruits which are occasionally confused, although they show very different characteristics, viz., the apples 'Northern Greening' and 'Yorkshire Greening.' Abstracting from Dr Hogg's description of each, we find the following, and the sketches are added to make the matter clear.

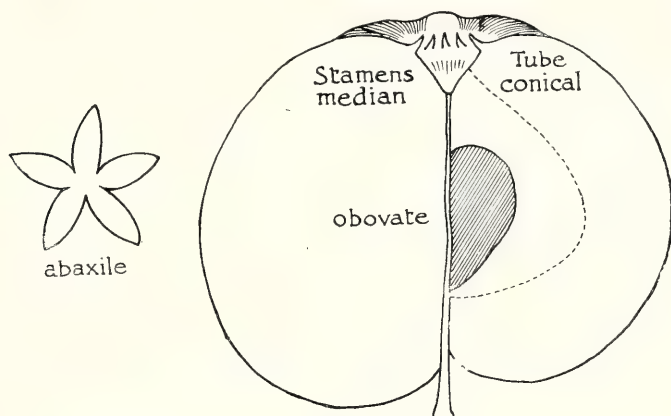
NORTHERN GREENING.

Eye, small and closed, with long segments, set in a narrow, round, deep and even basin; stamens, marginal; tube, funnel-shaped; cells (loculi), obovate; cells (loculi), axile.

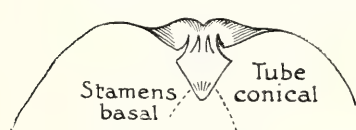


YORKSHIRE GREENING.

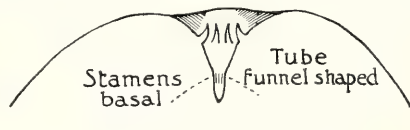
Eye, closed, with incurved convergent segments, set in a shallow, irregular, and plaited basin; stalk, short, stout and fleshy, covered with grey down, inserted in a wide and rather shallow cavity; stamens, median; tube, conical; cells, obovate; cells, abaxile.



There is a third position in which the stamens may be placed, viz., basal, in either a conical or funnel-shaped tube, as in 'Golden

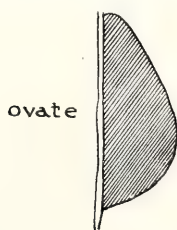


GOLDEN SPIRE



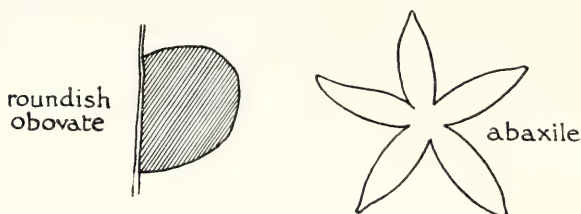
LANE'S PRINCE ALBERT

Spire' and 'Lane's Prince Albert.' In some varieties the cells (loculi) are ovate, as in Lord Suffield (which is also abaxile),



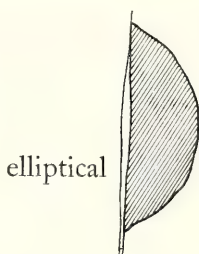
LORD SUFFIELD

round or roundish obovate, as in *Mère de Ménage* (which is also abaxile).



MERE DE MÉNAGE

or elliptical, as in *Golden Spire* and *Lane's Prince Albert*.



LANE'S PRINCE ALBERT

Each variety has also its own characteristics in flower, bark, leaf, or habit of growth. 'Northern Greening' has a small flower, while that of 'Yorkshire Greening' is by comparison large. The wood of the former is long-jointed, and bears large strong leaves with very little downiness beneath. It is an upright grower, and the young wood is red, spotted with grey spots. 'Yorkshire Greening' is a sprawly grower with large leaves. The young wood is red and long-jointed, and it and the under-side of the leaves are very downy.

THE BLACK CURRANT GALL MITE.

Eriophyes (Phytoptus) ribis.

By P. MURRAY THOMSON, S.S.C., Secretary and Treasurer,
Royal Caledonian Horticultural Society.

THOUGH known as a garden pest for upwards of thirty years, inquiries are so frequently made regarding the Black Currant Mite that a few notes upon it may be appropriate and instructive at this time. In some districts it is unknown, while in others very few bushes can be found unaffected by it.¹ The young leaf buds which harbour the mites become swollen and distorted, and these are certain indications of the attack. Later these leaf buds turn brown and dry without having unfolded. It cannot be said with certainty that the life-history of the mite which causes such destruction is thoroughly and generally understood; and when it is remembered that the mite is not more than one-hundredth of an inch in length, and some six to eight times less in breadth, it may be readily understood what have been the difficulties in arriving at an accurate knowledge of its life-history, and of its habits. Miss Ormerod (*Handbook of Insects injurious to Orchards and Bush Fruits*) says that the *first definite* allusion to the presence of this Black Currant bud disease in Britain took place at the meeting of the Scientific Committee of the Royal Horticultural Society on 2nd March 1869 (*Gardeners' Chronicle* for 1869, pp. 252, 276), and the facts subsequently elicited showed that in a very serious form (though the cause of which was not distinctly ascertained) the disease had been known in the district of Blantyre, Lanarkshire, for twenty years before that date.

Mr Cecil Warburton, Zoologist to the Royal Agricultural

¹ In an address delivered in Dublin on 20th October 1904, in connection with the Fruit Show organised by the Department of Agriculture and Technical Instruction in Ireland, Sir Horace Plunket stated that Black Currants had, owing to the ravages of the mite in Great Britain, been one of the best-paying small fruits in Ireland for the past three years.

Society of England, in the Journal of that Society, vol. lxii.,

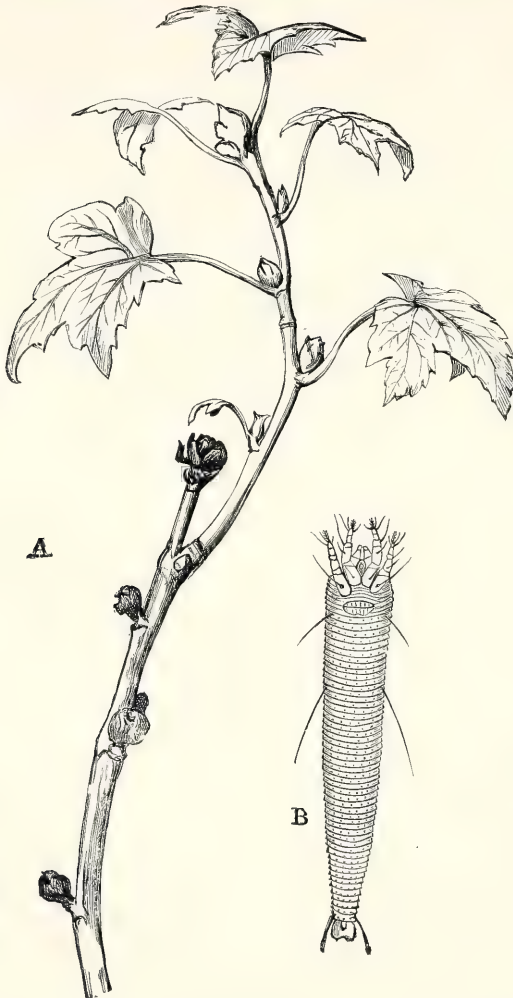


Fig. 1. A, infested black-currant twig, showing old wood with dead buds and new wood with sound and diseased buds. B, the mite enlarged about two hundred times, ventral view. Reproduced by permission from p. 258 of vol. lxii., 1902, of the *Journal of the Royal Agricultural Society of England*.

1901, page 257, and vol. lxiii., 1902, page 131, reports the results of some of his observations and experiments regarding the

pest; and from his Annual Report the following abridged extracts are made:—

“During no single month of the year, except perhaps December, are the mites unaccompanied by eggs and young.¹ . . . Some of the mites survive the winter in diseased buds on infested bushes, and as these are the parents of all subsequent broods, peculiar interest attaches to their fate. . . . The buds are either so slightly diseased that they contrive nevertheless to open out and put forth leaves, or they are so seriously injured that they never develop at all, but eventually die and wither. In either case they become uninhabitable, and the mite is constrained to change its quarters. . . . During February, March, and April the mites within them multiply rapidly. About the middle of May some of the buds may be observed to be cracked, and on them the mites can be seen externally.² From this time onward for three or four weeks the buds are gradually drying up and becoming unfit for habitation, and a constant migration of mites is taking place. Let us examine the behaviour of the mites on the surface of the buds from which they are escaping.

“Many of them are seen to be actively crawling about. This is a slow process, for the four short legs situated close to the head have a long inert body to drag after them. Still, by desperate scrambling an energetic mite can cover an inch in ten minutes or so. It is seldom, however, that such steady and uninterrupted progress is attempted, but the crawling motion is varied by a very extraordinary performance. The mites possess at the hinder end of the body a muscular disc, surmounted by

¹ Mr Robert Newstead states that mites are present in the swelled buds in the perfect condition in January, and not apparently injured beyond being made temporarily somewhat sluggish by severe frost. Eggs also are then present. “Recent Investigations of the Currant Bud Mite (*Phytoptus ribis*),” by R. Newstead, F.E.S., Curator of the Grosvenor Museum, Chester, Lecturer on Economic Entomology for the Cheshire County Council, pp. 5-7. Reprinted from *The British Naturalist* for June 1894.

² Mr Newstead records that on 19th April many of the old and badly infested galled buds of the previous year had opened out very considerably, but had not produced, nor did they afterwards produce, a single leaf. These and the rest of the infested buds contained a living mass of the mites in all stages, completely covering every embryo leaf in the buds. All the old buds that were examined had no living mites in them, but the dead white desiccated bodies of thousands of mites covered the surface of the dead leaves of the buds.

two rather stiff curved bristles. At frequent intervals they rear themselves up on this tail disc, and stand upright, feebly waving their legs in the air. Many mites may be seen thus

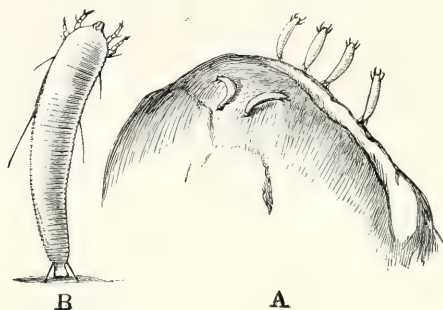


Fig. 2. A, portion of bud with mites crawling and standing erect. B, erect mite, more highly magnified. Reproduced by permission from p. 261 of vol. lxii., 1902, of the *Journal of the Royal Agricultural Society of England*.



Fig. 3. Infested buds of previous year (magnified). (Photo by A. W. Borthwick, D.Sc.)

standing up, like so many skittles, on the surface of the bud which they are on the point of leaving.

“The object of these antics is at first by no means obvious, but a few experiments make their purpose sufficiently clear.

When touched with a needle-point while in this attitude they immediately let go their hold of the bud and are carried off on the needle. If touched with a camel's-hair brush, numbers are carried away wriggling in between the hairs. . . . But needles and camel's-hair brushes are hardly the most likely objects to present themselves to the expectant mites in the course of nature. If they are indeed feeling about blindly in the hope of coming into contact with some object to which they may attach themselves, what is most likely to fulfil their expectations? Clearly some passing insect or arachnid.

"The matter is soon put to the test. Spiders, mites, and ants are induced to run over the infested buds. Flying insects which are observed to alight on the buds are caught and subjected to microscopic examination. In almost every case mites are found clinging to the hairs on the legs or bodies of the insects. We can hardly doubt, therefore, that this habit of rearing themselves upright and waving their legs in the air has been acquired for the definite purpose of obtaining the aid of passing insects in the accomplishment of journeys far beyond the reach of their own limited powers of locomotion. From bush to bush, down one stem, across rugged ground, and up another stem, would be a prodigious and impossible journey for a crawling mite. But an aerial journey for a considerable distance is quite a simple matter. It amuses the mite and does not hurt the fly.

"Since any passing creature is seized indiscriminately, it is a mere accident if the mite reaches a destination which is of the slightest use to it. Myriads of those that are thus borne away must be carried far from their food plant and perish of starvation. Only those lucky individuals which are taken to other black-currant bushes have a chance of survival, and in their case ultimate safety is by no means assured. It is obvious that some insects will serve the purpose of the mite far better than others. An insect which casually alights on the plant may not chance to visit another black-currant bush at all, or, at all events, not until after a long interval. On the other hand some insects confine their attention to this particular plant, and it is by these, no doubt, that the mite is principally distributed. Perhaps the best example is the currant *Aphis* or green-fly, which is almost sure to be present to some extent. The

aphides crawl along slowly, feeling their way with their antennæ, as a blind man taps the ground in front of him with a stick. When these insects were examined after passing over an infested bud, during the migration period, mites were certain to be found clinging to their antennæ. Now certain individuals of the green-fly are winged, their function being to spread abroad the aphis attack, and in doing this they doubtless also distribute the mite. The problem of the distribution of creatures by no means gifted with effective organs of locomotion is therefore solved.

"Another curious phenomenon remains to be described. The upright position would often be maintained by a mite for five minutes or more, consecutively. Then, apparently despairing of outside aid, it would generally continue its crawling motion, rearing itself on end again a little further on. But sometimes the mite under examination would suddenly disappear, so quickly as at first to completely baffle the attempt to see what had become of it. After this had occurred several times, the creature was, so to speak, caught in the act, and it was seen to have the power of projecting itself endwise, like a rocket, apparently by the instrumentality of the tail-disc above mentioned. To be sure, no great distance was accomplished by the leap, though it sometimes measured sixteen times the length of the mite, but it was at all events sufficient to carry it clear of the bud or stem on which it was standing, and to precipitate it to the ground or to some lower portion of the bush. The standing mites could always be induced to leap by blowing upon them, and it therefore seems as though they wait for a favourable puff of air to attempt this last and desperate method of departure. They may possibly hope by this means to obtain an insect not near enough to brush against them, but close enough to fan them with its wings.

"At all events, they clearly have three modes of departure—by crawling, by leaping, and by attaching themselves to insects; and we are now confronted by the most difficult, and at the same time the most important, problem of their life-history—the question of their immediate destination. Subsequent events show that some of them, though a very small minority, reach the new buds which have just begun to develop, and the manner in which, and the extent to which this is accomplished, will be

presently described. Of the vast majority, which are not so fortunate, three things are conceivable. Either they all perish, or they take refuge in the ground, and, possibly, lay eggs there which shall give rise to future generations; or they find a temporary shelter under loose bark, and there wait for happier times. It is most important to test this second possibility, for it has been tacitly accepted that the ground beneath infested bushes is capable of spreading the disease, and dressing it with gas-lime is commonly recommended as an important supplement to the pruning and washing measures adopted with regard to the plant itself. Now it is true that negative evidence can never be conclusive, but the most careful observations have failed to discover anything but a more or less speedy death to occur to those mites which reach the ground.

“Ordinary soil under the microscope presents eminences and chasms, over and into which it is impossible to follow so minute a creature as the gall mite. It is sufficiently difficult with especially smoothed and flattened mould, but over this the mites have been traced for hours in the hope of finding some indication that they have reached an environment congenial to them. Sometimes on wet earth, and sometimes on dry, their behaviour has been closely watched, in the hope that they may be detected in concealing themselves in convenient crannies, or, at all events, in depositing eggs. In no case was such an act observed. The mites wandered aimlessly, sometimes crawling, at others rearing themselves on the tail-disc, as though as far as ever from their real destination. They continued this restless behaviour for two or three days, and eventually died. If they do, indeed, in any sense make themselves at home in the ground, I have been unfortunate in finding no trace of the fact. I am strongly of opinion that those mites which reach the ground simply die there, unless they can very speedily crawl up another stem, or are lucky enough to be rescued from their perilous position by passing insects. If this is true, the desperate nature of the leap into space becomes at once apparent.

“No greater success attended all attempts to detect the mites concealing themselves under loose bark or in cracks on the stem, nor would they have anything to do with the roots of the plant when placed upon them.

“Meanwhile, strict watch was being kept upon the buds now developing to provide next year’s foliage. At the end of May they were easily visible in the axils of the leaves, and, though quite small, were beginning to swell.

“In the first week of June mites were observed outside these buds, in the leaf axils,¹ and on 7th June a mite was seen to work its way into a bud, wriggling in between the sheathing leaves.²

“Almost daily during June a number of new buds were removed from infested bushes and examined under the microscope for mites—a procedure somewhat akin to the proverbial search for a needle in a haystack. They were first found on June 8, and from that date onwards they occurred in an increasing number of buds. A matter for some surprise was that they were always found near the middle of the bud, the closely wrapped leaves of which must present great obstacles to the entry of the mite. As a rule, one or two mites only were found in each bud, and these were mature animals, within whose bodies eggs were clearly visible. The frequent examination of buds was continued with the object of detecting the first signs of multiplication of the mites within them, and eggs³ and larvæ

¹ On June 2nd Mr Newstead, examining the buds on newly formed shoots, found, between the leaf stalk and the buds just protruding behind the leaf stalk, both adults and nymphs, but no eggs. Although these latter were not found in the situations indicated, they must have been laid there, or the nymphs would not have been present.

² “On July 17th” (writes Mr Newstead) “I again found the mites located between the leaf-stalks and the buds, and with them many eggs; while ten days later (July 27th) newly-formed buds, still small, were present, but terminal ones were already showing signs of being infested. On examination these were found to contain adults, nymphs, and eggs, nearly all of which were located in the centre of the buds. This was the first occasion I found the mites within the newly-formed buds. The old infested buds at this date were everyone of them dried up.”

³ Miss Ormerod writes: “These (eggs) were oval or ovate when in characteristic condition, but sometimes irregular in outline, apparently from being pushed out of shape by the developing mite within; but I was not fortunate enough to find a specimen in the very act of developing (as I have seen in the case of *Phytoptus* of the Birch knots), and thus did not have the opportunity of seeing (and figuring) the mite coming out of the egg in the four-legged condition in which it continues through life.

“In the case of specimens from Woburn, I was particularly struck with the large size of the egg in comparison with the mite, and turning to the observations of Dr A. Nalepa on this subject, I find that he notices that ‘the eggs’

were first found on June 26. Hereafter the increase was rapid, mites in all stages being found within the buds, gradually extending from the centre outwards, until by the end of July some of the creatures were only concealed by the loose external leaves.

"The rapid increase of the mites within the new buds during June and July suggested that a second migration period was at hand in the autumn, but this was watched for in vain.¹ Rare cases of external mites were observed, but there was no sign of a general exodus. . . . The attack under special observation was a very severe one, but even in this case very few autumnal wanderers were seen, nor was there any further striking incident to record. The diseased buds were much swollen in October, but were still fresh and green and full of mites snugly sheltered from the inclemencies of the coming winter.

"The red-currant plant is not usually considered to be subject to the attack of the gall mite, and certainly no complaints are ever made of its devastations. Nevertheless, it is liable to the disease in a modified form when in the neighbourhood of badly infested black-currant plants. In the course of the present investigation, red-currant plants were frequently examined, and for a long time the absence of any of the typical swollen buds seemed to indicate freedom from the disease. At the end of July, however, several of the mites were noticed at the base of the young buds in the leaf axils. It was thought at first that they might be casual wanderers from the black-currant bushes close at hand, but the presence of eggs and larvæ soon showed that they were tolerably at home in their present quarters, and could live and multiply there.

"In one respect the attack was remarkably different from that on the black currants. The mites did not immediately proceed to the centre of the bud, and thence gradually spread

(of the gall mites) 'are relatively to the minuteness of the creatures of considerable size. . . . The egg shell is thin, flexible, and formed of chitin.' The author also remarks: 'In the latter part of summer and in autumn the mites leave the galls in multitudes to take possession of their winter quarters—that is, the buds. This emigration also is of frequent occurrence during summer, when the previously inhabited buds dry up.'

¹ See Dr A. Nalepa's remark above quoted by Miss Ormerod.

outwards, but they settled down on the outside, and, as they multiplied, some of the brood crept into the bud and the attack spread centripetally.

"The importance of this observation does not lie in the danger to the red currants, which never seem to suffer much, and which were in no instance found to be diseased, unless in the neighbourhood of badly infested black-currant bushes. But the red currant can no longer be entirely overlooked in the problem of eliminating the disease. Indeed the intermixture of red- and black-currant plants sometimes recommended would seem to be undesirable, because the different behaviour of the mite on the red currant introduces an element of uncertainty, the mite being external on that plant long after the migration period has ceased on the black currant. . . .

"Briefly stated, the life-history of the black-currant gall-mite seems to be this. Buds containing the mite survive the winter. They are either so slightly diseased that they develop and turn out the mites which, finding no proper haven, quickly perish, or they are entirely abortive, and remain on the stems till they dry up in June. As they wither the mites are driven forth, and of the myriads which seek distribution by crawling, leaping, and attaching themselves to insects an insignificant number reach the new buds, the rest all perishing.

"The lucky few are, however, quite sufficient to set up the new attack, and increase with phenomenal rapidity within the new buds during July and August, after which time their rate of multiplication diminishes. The diseased buds, swollen and distorted, remain on the bushes during the winter, together with those which have escaped infestation.

"The immediate object of this investigation was the elucidation of the life-history of the mite. If the results may be accepted—and it is highly desirable that they should be confirmed by other observers—certain items in the treatment usually recommended for the disease may be discontinued as useless. Fruit-growers are frequently advised to remove the surface soil, or apply a dressing of gas-lime beneath the bushes. But, if we are correct in the view that nothing comes of those mites which remain on the ground, all this is so much waste labour and expense.

"Again, spraying or washing with paraffin emulsion is either vaguely recommended without specifying a time, or different dates are proposed by different economic entomologists.

"From the conclusion here arrived at, it would seem to be unnecessary to spray in the early spring, since the mites, then wandering, will die without our intervention, and in the late summer and autumn the wanderers are so few that the game would not be worth the candle.

"If washing be resorted to, the time indicated would be from the middle of May to the middle of June (judging by the past year),¹ and this is just the period when there are difficulties with regard to the blossom, so that washing at any time is of doubtful value.

"There is one brief period in the life-cycle of the mite which seems to me to possess peculiar interest, whether or not any practical use can be made of it. This is, or was in the past year, the last week in June, when the mites are reduced to a minimum. A fortnight previously they were present in myriads, and a fortnight later they swarmed again. At this time, of all the countless hosts of mites on the move early in June, only an infinitesimal number, perhaps an average of two or three in each of such of the new buds as had acquired the disease, survived, and these had as yet hardly begun to multiply. Drastic measures at this time would seem to have a much greater chance of success than when the mites are present in thousands. What would be the best line of action it is difficult to say. The removal of all the new wood bearing next year's buds ought, practically, to remove the whole of the attack, but it is quite likely that this suggestion will be condemned as impracticable, and too destructive of next year's crop. Yet a trial might be given to it, preferably in the case of a small clump of infested bushes far removed from other diseased plants, so that the experiment should not be vitiated by re-infestation. All the new shoots should be carefully cut off in the last week of June and burned. It would be found that the plant would still manage to put forth new buds, and these ought to be free from the mite. The next year's crop would certainly suffer, and the operation would be tedious, but there are severe cases where it would be worth trying.

¹ 1901.

"The old-fashioned measure of hand-picking¹ the diseased buds in the winter would still appear to be one of the best means of keeping the attack in check. It is of the highest importance, in striking new plants, to select cuttings from bushes free from disease."

In his Report for the following year (1902), Mr Warburton states that, although the pest had been again under observation, nothing had "arisen to modify the conclusions previously arrived at, except as regards the dates at which the various events in the life-cycle of the mite occur.

"Weather influences during the present year² have retarded the developement of insects and mites, as of plants, and, as compared with 1901, events occurred at least a week later. . . . The former year may be considered the more normal," and he adds: "It is unfortunate, but it is undoubtedly the case, that the results of the investigation as regards the treatment of the disease were largely negative, demonstrating the uselessness of most of the remedial measures generally adopted. The more

¹ Miss Ormerod writes: "In the following notes, sent me on April 7th, 1897, by Mr C. D. Wise (Manager of the Toddington Fruit Grounds, Winchcombe, Gloucestershire), it will be seen we have details of the number of quarts of galled buds gathered in the years 1896 and 1897, with cost of gathering per acre; and also the absence of benefit from the outlay:—

"*Gall Mites on Black Currants*.—We have a very serious attack of Gall Mites this spring, as will be shown by the following statement:—

| Field Number. | Year. | Quantity of Galled Buds picked per acre. | Cost of Picking. |
|---------------|-------|--|-------------------|
| 1 | 1896 | 1½ quarts | 3s. 6d. per acre. |
| | 1897 | 12 " | 7s. 6d. " |
| 2 | 1896 | 2½ " | 4s. 6d. " |
| | 1897 | 8 " | 6s. 9d. " |
| 3 | 1896 | 4 " | 5s. 9d. " |
| | 1897 | 16 " | 10s. 10d. " |

"Where we have picked the Gall Mites off last autumn, the attack seems to be quite as bad this spring. You will see that the cost per acre picking off the galls comes to a very serious item, but I do not see that there is anything else we can do; if you can suggest anything we shall be very glad."

"On December 22nd (1897) Mr Wise reported further: 'I am sorry to say that the Black-Currant Gall Mite increases with us; the bushes are covered with galls.'"

² 1902.

the subject is considered, the more obvious becomes the importance of obtaining a pure stock in the first instance. Many fruit-growers are in the habit of periodically burning down and destroying their hopelessly diseased bushes and replanting with cuttings bought in the market. As likely as not these are already infested by the mite, and the costly remedy has to be applied again in a few years.

"It has occurred to me that great benefit would accrue, both to sellers and buyers of black-currant cuttings, if those who supply them would have their crops examined by an expert to determine whether the mite is present or not. A certificate of freedom from the disease would be of considerable value to the possessor of a fine crop, and buyers would be only too glad to be sure that the cuttings supplied to them come from a pure stock. . . ."

If *all* the growers in a district where black currants are affected were to combine to endeavour to get rid of this pest, there might be good hope of success. We fear there is very little hope otherwise. In some cases it might be the quickest and surest plan to root out and burn every bush, taking care that when again planting only bushes which were free from mite were used. The hard cutting back of all diseased bushes, and the burning at once of the branches, followed by careful destruction of all affected buds which might afterwards appear, might be effectual if carefully and systematically followed out. Where a supply of liquid manure from cow-sheds can be easily got it might be frequently sprayed over the whole wood and foliage of the bushes from the middle of May till the end of June or middle of July. One plantation of Black Currants which was very badly affected a few years ago was seen by us recently, and it appeared to be quite free of the pest. The gardener explained that in the early summer, and again in autumn, liquid manure, of which he had a plentiful supply, was freely thrown over the bushes, and certainly they were clean and fruitful. Where this treatment is practicable it is worth trying.

CULTIVATION OF CARNATIONS ALL THE YEAR ROUND.

By DANIEL KIDD, The Gardens, Carberry Tower, Musselburgh.

THE TREE OR PERPETUAL-FLOWERING CARNATION.

THE value of this type of Carnation lies in its flowering freely in the winter and spring months. The Border and Malmaison Carnations cannot be treated so as to induce them to flower in winter, whereas it is natural for the Tree or Perpetual-flowering type to flower then. In the latter the method of culture differs all through from that applied to the Border and Malmaison types, but good flowering plants are easily obtainable. The Border and Show Carnations, whether grown in pots or planted out, pass out of bloom by the middle of September. About the end of that month, or the middle of October, the Tree Carnations begin to bloom, and with good management flowers can be obtained throughout the winter and spring months, or until the Malmaisons come into flower early in April. Of course, to secure this a heated greenhouse is required. The Tree Carnation is, I consider, best propagated by cuttings. The first batch of these should be put in about the middle of January. A propagating frame is required with some bottom heat, say about 70 to 75 degrees, and the plunging material should be cocoanut fibre. The cuttings should be inserted in small pots, sandy loam with a little leaf mould being used, and a layer of sand may be spread on the surface. The cuttings should be firmly inserted, and the pots plunged to the rim in the plunging material. The cuttings soon form roots, and this can be easily ascertained by the growth they make. As soon as the cuttings are well rooted, they should be potted off into larger pots, and in order to form nice bushy plants their growth should be stopped by pinching out the centre with the fingers. The plants must be kept in a heated house until they have made some growth, but they should be taken into a cooler house as the

season advances. The plants will grow rapidly, and they require to be repotted as soon as the small pots are fairly well filled with roots. They should be grown on in a cold frame all summer.

The following varieties of the American Tree Carnation—viz., ‘G. H. Crane,’ ‘Enchantress,’ ‘Mrs Thomas,’ ‘W. Lawson,’ ‘Floriana,’ ‘Lady Carlisle,’ ‘Royalty,’ ‘Harry Fenn,’ and ‘Prosperity’—flower, I find, much better with us through the winter months than the older varieties.

SOUVENIR DE LA MALMAISON CARNATION.

The principal methods of propagating this Carnation are by layers and cuttings. When propagated by cuttings, the strongest side-shoots are inserted in small pots or boxes, and stood upon a slight hotbed until rooted, when they may be potted into small pots and grown on in a cold frame. Cuttings should be taken in early spring. Layering I consider the best method of raising good, healthy young plants, and this should be performed about the beginning of July. For this kind of propagation strong one- or two-year-old plants are preferable to older ones, as the younger the plants are the stronger are the growths produced, and a great deal of the after success of the young plants depends upon a good start. In preparing a plant for layering, it should be turned out of its pot, and planted in a cold frame, and the planting should be done so that the young growths may rest upon the soil. The leaves should be removed from the basal portion of the shoot, and a slit about one inch long should be made on its under side. The slit portion, with its tongue, should be pegged into some nice sandy soil placed underneath the shoot. After the plants are layered, the frame should be kept close and shaded for a few days, plenty of air being admitted as soon as root action takes place; and plenty of water should be given if the weather is hot. In about six weeks each layer will have formed a good ball of roots and be ready for first potting. The layers should be severed from the parent plant, care being taken not to injure the young roots. Pots four inches in diameter should be chosen for the potting, and these should be thoroughly clean, and well drained. The compost for this potting should consist of two parts good fibrous

loam, one part old lime mortar, the remaining part being made up of sand and a sprinkling of soot. If the loam is heavy, the addition of a small quantity of charcoal will assist in keeping it open. After potting, the plants should be placed on a layer of ashes, and should be kept close to the glass, and the frame should be kept closed for a few days to enable the young plants to make a fresh start. Plenty of air should afterwards be admitted, both by night and day, so as to encourage a sturdy growth. The plants should be shaded from bright sunshine, as at all times the growth, when under glass, seems unable to withstand strong sunshine, and if too much exposed to it, the leaves soon take on an unhealthy-looking yellow hue.

About the middle of October the young plants will be ready for their winter potting. For this six-inch pots will be required, and the compost should be much the same as recommended for the previous potting, the loam perhaps being a little coarser in texture. After potting, the plants should be placed in an airy greenhouse, and stood close up to the glass, and there they may remain to flower. This will, all being well, take place about June, each plant producing a single spike with a number of side shoots. If extra fine blooms are required, all the side blooms should be removed and the terminal one only allowed to develop. This procedure, however, I consider a wasteful one. By a partial thinning three good blooms may be obtained, or by allowing the species to follow their natural course a beautiful spray with many flowers in different stages of development will be the result. About the end of August the final potting should take place. Clean, well-drained eight- and nine-inch pots will be necessary for this potting, and a compost consisting of the following should be used, viz., three parts good fibrous loam, one part old lime mortar; and one six-inch pot of half-inch bones and a good sprinkling of soot should be added to every barrowful of soil, with enough sand and charcoal to keep the whole porous. Before potting, the plants should be examined for insect pests, the most troublesome of which is green-fly. I find an occasional fumigation with *KL All* is of great assistance in keeping the plants free from green-fly. At this potting the soil should be rammed firmly round the ball of the plant, using a blunt stick for the purpose. After potting, place them

as directed for the young plants. If grown on stages in a Carnation house, they should be kept as cool as possible, by admitting plenty of air by both night and day. The following summer they will make a good display, and will then be about their best.

BORDER CARNATIONS.

Propagation may be effected by layers, cuttings, or seeds. Layering I consider the best method of raising good healthy plants, whether the plants are grown in pots, borders, or beds. The end of July or the beginning of August is the best time for layering. Before commencing, a compost of leaf soil and sharp sand in nearly equal proportions should be prepared, and some pegs, made from bracken stems, or other material of a like nature which will decay in the soil, should be procured. A layer of the compost, about two inches in thickness, should be placed round each plant, as into this the young plants will root. The shoots selected for layering should be cleared at the base of a few of their leaves. A slit one inch in length should be made on the under side of the shoot, and the layer should next be carefully pegged down in its place, the incision being kept open. About one inch of soil should then be placed over the layered part, to a little beyond the peg, and the whole well watered. If dry weather ensue, it will be necessary to give occasional watering, but care must be taken that the shoots are not denuded of soil. Where shoots are too short, or too numerous for layering, or where they become broken by accident, it is desirable to propagate by cuttings. Cuttings may be taken before the time for layering. For this mode of propagation it is necessary to have a slight hotbed, on which four inches of fine light soil should be spread and covered with sand. The cuttings must be long enough to have a tolerably firm base, and they must either be taken with a heel, or cut off at a joint, and firmly inserted in the soil. After a watering, the lights should be placed on the frame, and the cuttings must be kept close and shaded. The soil must be maintained moderately moist till the roots are formed, but damp must be guarded against.

As regards winter treatment, I generally find that by planting the layers about the middle of September where I intend

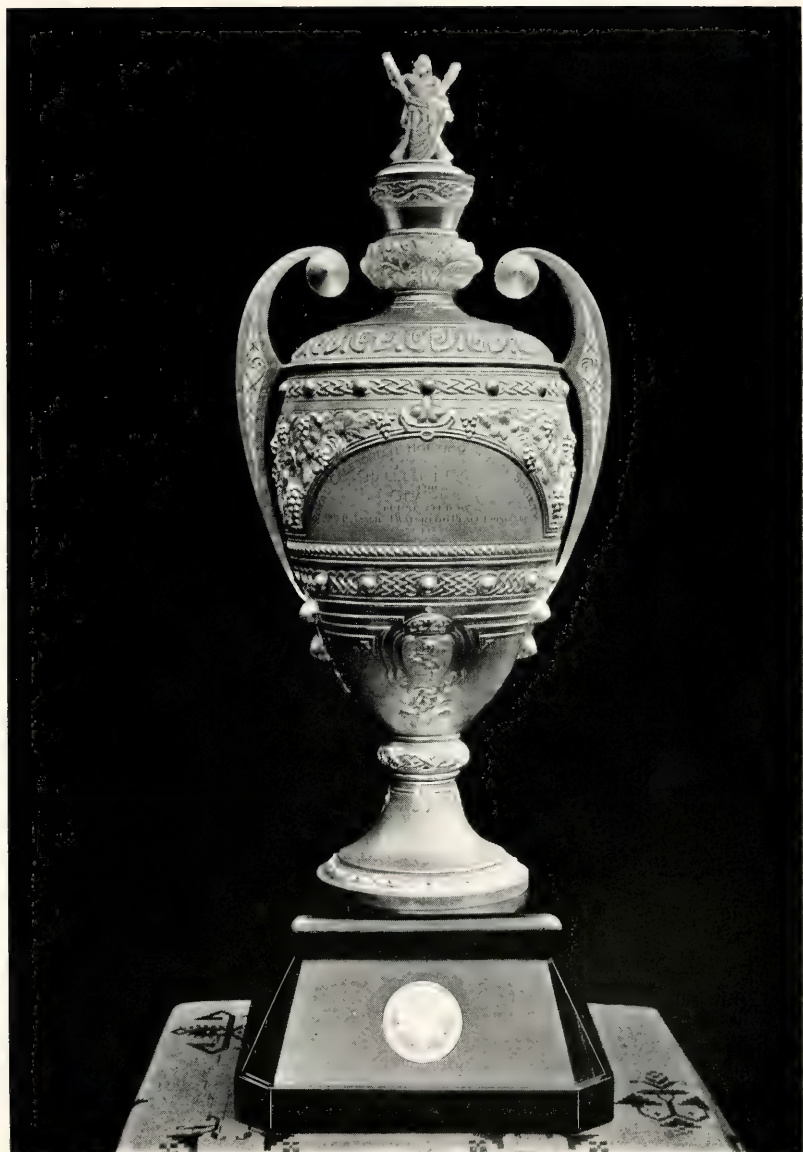
them to bloom the following summer, the plants do much better than when put into frames. It is, however, necessary to provide accommodation in cold frames for a portion of the stock; and when a choice collection is grown, it would be useless to attempt to keep it intact without winter protection. About the middle of September, when they are well rooted, the layers should be potted singly in three-inch pots. The potting compost should consist of loam two parts, leaf soil one part, and sand one part, with a fair amount of drainage. After potting, a good watering should be given, and the frame should be kept close for a week or two until root action is resumed, after which air may be freely admitted. Throughout the winter full advantage should be taken of fine weather to give all the air possible. This should be done by tilting, or entirely removing, the lights. If bleak winds prevail, it will be necessary to tilt the lights in a direction opposite to that of the wind, until the beginning of February, when, as a rule, the plants begin to grow. Great attention must be paid to watering. The plants must be kept somewhat dry rather than excessively moist, as their greatest enemy in winter is damp. If kept too wet, a disease known as 'spot' is likely to appear on the foliage, and this may prove prejudicial to their growth. After February they may have more water — in fact, it will then be very injudicious to allow them to get dry.

Propagation of Carnations by seed is a very interesting operation. By this means new and excellent varieties may be raised. Both single- and double-flowered plants generally may be produced from a packet of seed, and the latter can be selected and the best perpetuated by layering. Anyone with a good strain may save his own seed. Hybridising may be effected with the best flowers in each class, so as to secure seed which will probably produce new kinds. The most suitable time for sowing is in March or April, and the best plan is to sow on a slight hotbed. The seed-pans should be properly drained, and then filled with fresh sandy loam and leaf soil to within an inch or so of the top. The soil should be made tolerably firm, and the surface afterwards levelled before sowing the seed. The seed should be scattered evenly over the soil, and then slightly covered with a little of the potting mixture which has been finely sifted. To keep the whole

uniformly moist, a piece of glass should be laid on the top of the pan, and this should remain till the seed germinates, after which it should be removed and the pan placed in an airy position near the glass. As soon as the seedlings can be handled, they should be pricked out in boxes. The compost into which the seedlings are pricked should be formed by mixing some fresh loam, old spent hotbed manure, and sand. The seedlings should be watered when necessary, and by the end of August the plants will be sufficiently large to transfer to their permanent positions in beds or borders, where they will bloom the following season.

SCOTTISH CHALLENGE TROPHY FOR GRAPES.

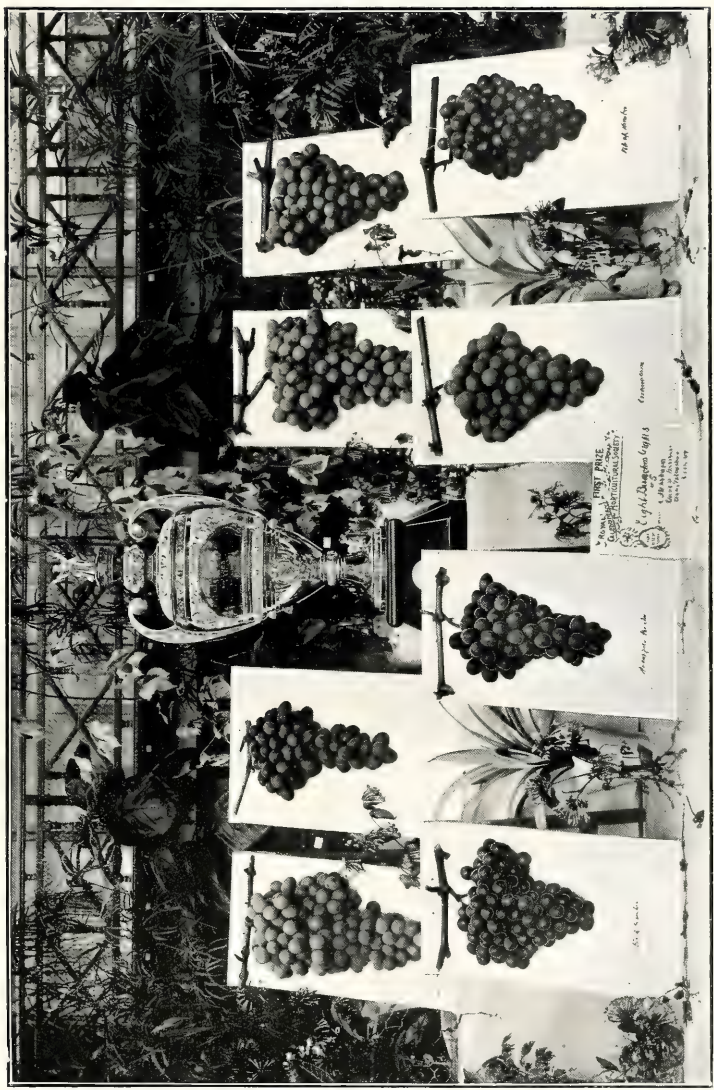
At the autumn shows of the Royal Caledonian Horticultural Society the exhibition of Grapes forms a striking feature, and in order to still further stimulate the cultivation of this important fruit by British gardeners a handsome trophy has been presented by Mr W. H. Massie, of Messrs Dicksons & Co., nurserymen and seedsmen, Edinburgh, for competition in this class. The trophy, of which an illustration is here given, takes the form of a vase, of solid silver, $28\frac{1}{2}$ inches in height, on a plinth of ebony, and of the value of 50 guineas. The upper part of the bowl of the vase is richly chased, the ornamentation consisting of representations of Grape fruits and foliage. On one side of the bowl is the inscription "Royal Caledonian Horticultural Society—Scottish Challenge Trophy for Grapes presented by Mr W. H. Massie, 1 Waterloo Place, Edinburgh, 1904," and on the other side a space is reserved for the names of the winning competitors. The ornamentation of the top and bottom parts of the vase, and of the handles, is of Runic design. The handles arise from near the base of the bowl, and, curving inwards at their extremities, terminate in spindle-shaped knobs; and the termination of the upper part of the vase takes the form of a Scotch Thistle, surmounted by a figure of Saint Andrew. The trophy is offered in a class for eight bunches of Grapes, not more than two bunches of any variety, and the winning competitor also obtains the Society's gold badge and £15 in money. The competition is open to the whole of the United Kingdom, and in the event of one competitor winning the trophy three times it becomes his absolute property. In 1904 the trophy was won by Mr J. H. Goodacre, gardener to the Earl of Harrington, Elvaston Castle, Derby. An illustration of Mr Goodacre's exhibit is given at page 85.



SCOTTISH CHALLENGE TROPHY FOR GRAPES.



SCOTTISH CHALLENGE TROPHY FOR GRAPES.



Muscat of Alexandria.
Gros Maroc.
Black Hamburgh.

Muscat of Alexandria.
Gros Maroc.

Madresfield Court.
Madresfield Court.

Muscat of Alexandria.
Black Hamburgh.

1st PRIZE COLLECTION 1904.

Winner—J. H. GOODACRE, Gardener to the Earl of Harrington, Elvaston Castle, Derby.



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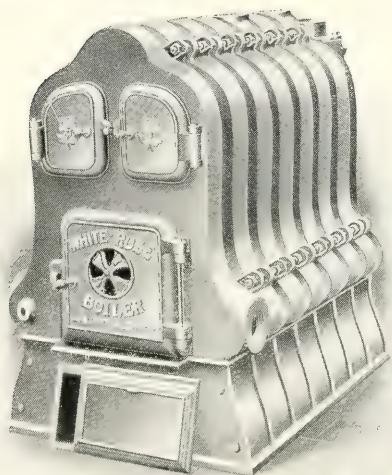
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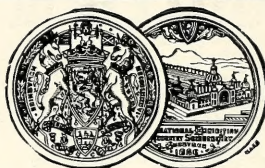
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Since the fund was established **204 orphan children**, residing in all parts of the Kingdom, have been elected to receive its benefits, and during the same period the sum of £13,522 has been disbursed in weekly allowances, etc.

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Every subscription of 5s. entitles the giver to one vote at the next Election, and every donation of £5 to one vote at each Election for life.

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Copies of the Rules and any particulars that may be required with reference to the management of the Fund will be gladly furnished by—

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Secretary,

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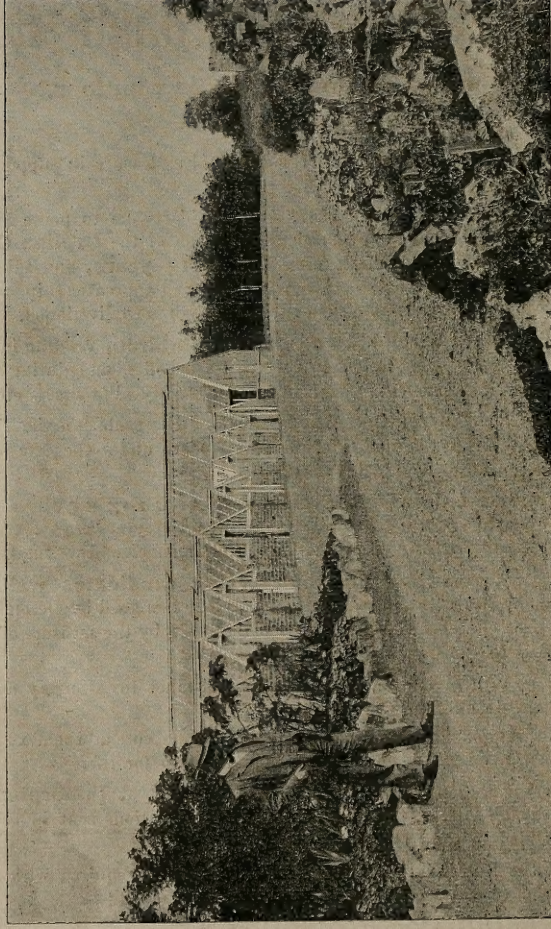
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